the OIL AND GAS JOURNAL

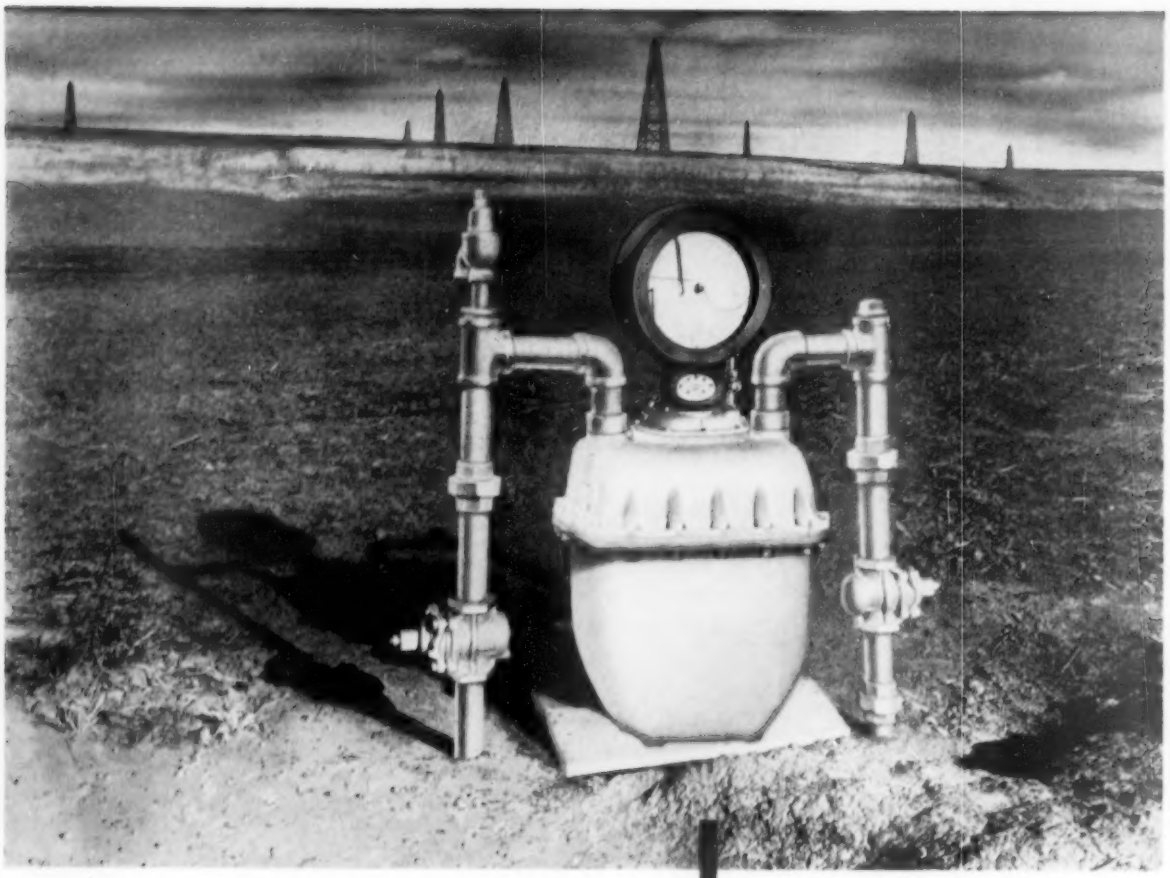
SEPTEMBER 26, 1955

ANNUAL DRILLING NUMBER

What's New in Drilling
Articles on methods and equipment . . .

Survey of Active Drilling Areas
Drilling data and prices on 65 fields . . .
P. 214

featuring SLIM hole drilling . . P. 143



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PAGE 1 ONE . . . *a glance ahead*

Look for some new results soon on in situ combustion. This technique as a means of obtaining complete oil recovery is still highly regarded by a number of companies. Field research is under way in several sections of the country. All variables are being watched.

Market students are giving thought to immediate and long-range significance of the products pipelines proposed between the Gulf Coast and East Coast. Some see major shifts in the movement of Gulf Coast products to offset actual and prospective losses in East Coast tanker markets.

Some drilling contractors believe techniques of drilling with air and gas or with aerated mud are still in their infancy. Costs have been cut, but bigger savings are expected as improved methods are developed to decrease hydrostatic head of the mud column on the formation.

Petroleum research, particularly in the processing end, is due for a sizable shot in the arm. Those in the know expect the industry's research budgets to double and then double again in the next several years.

As octane ratings climb, refiners are devoting much attention to the blending qualities of their various gasoline stocks. By selecting certain cuts to blend with certain others, refiners can improve their over-all octane picture on regular and premium fuels.

Improvements in turbodrill design may usher in a revolution in drilling methods. New Russian designs are reported to increase drilling rate by more than two-fold in all types of formations. American turbodrills have not reached this point, but new designs are coming off the drawing boards that may reach or surpass the efficiency of the Russian tools.

The OIL AND GAS JOURNAL

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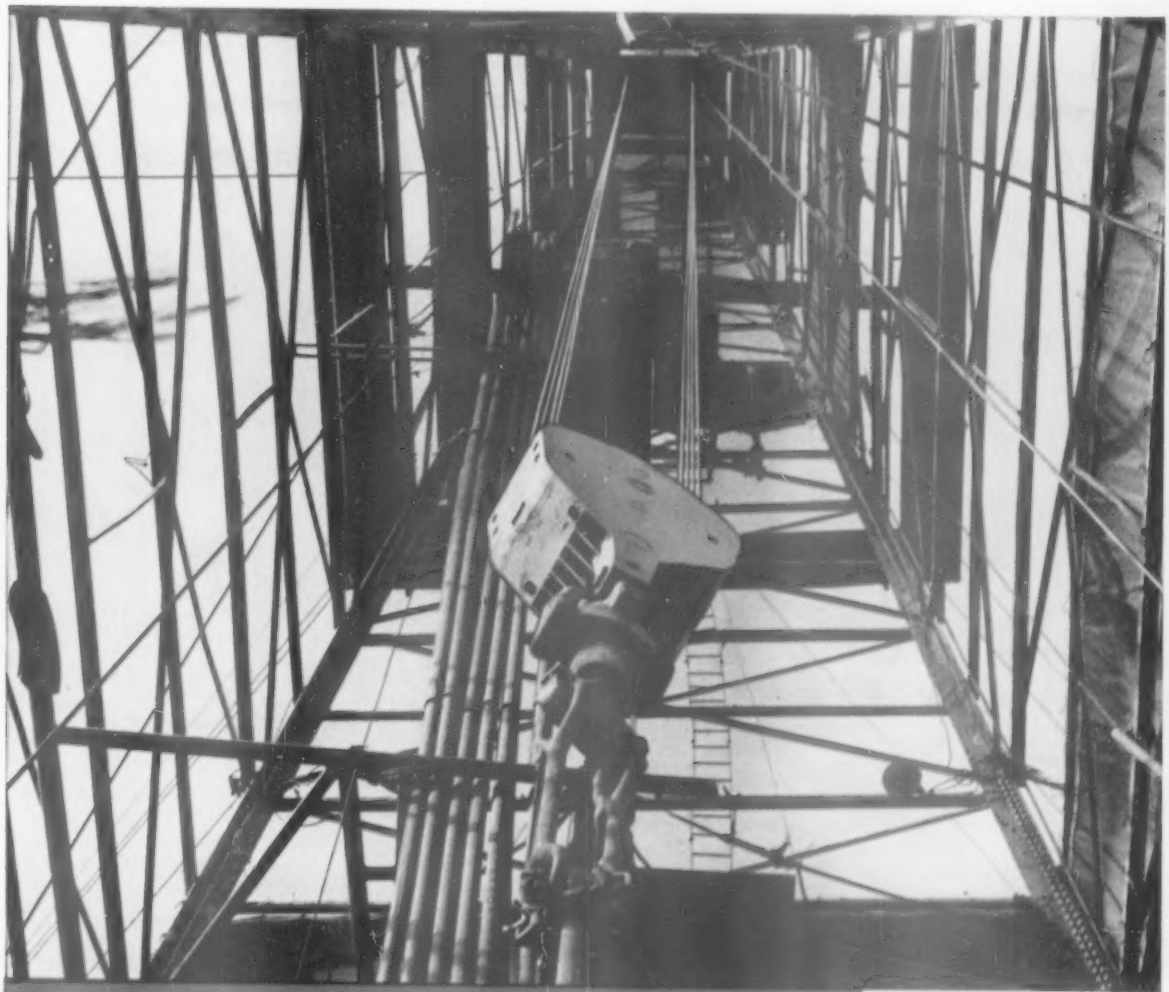

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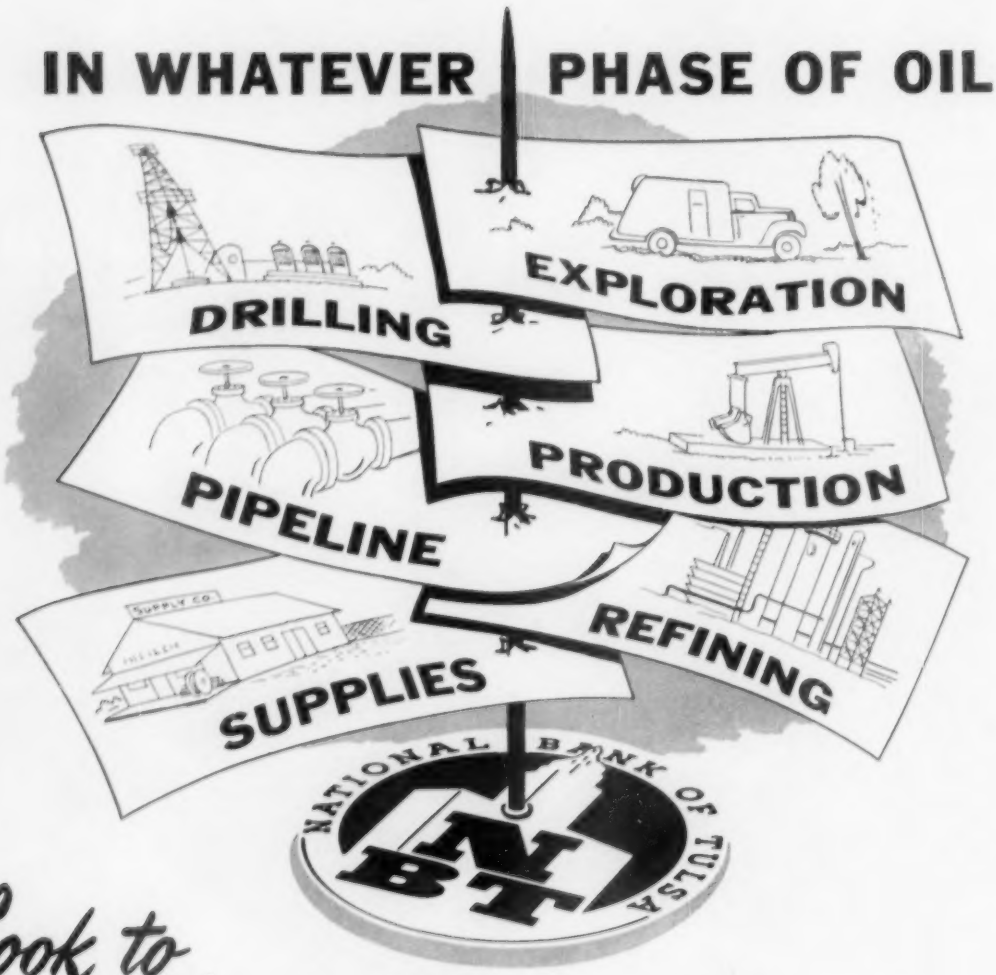

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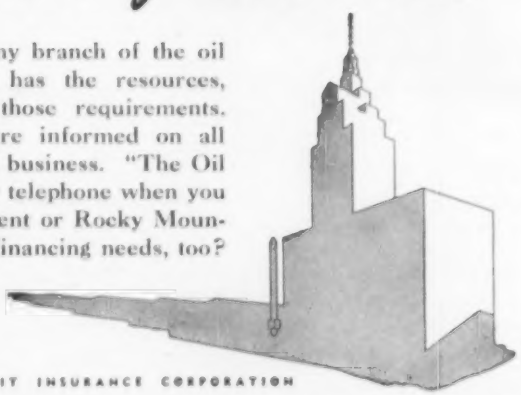

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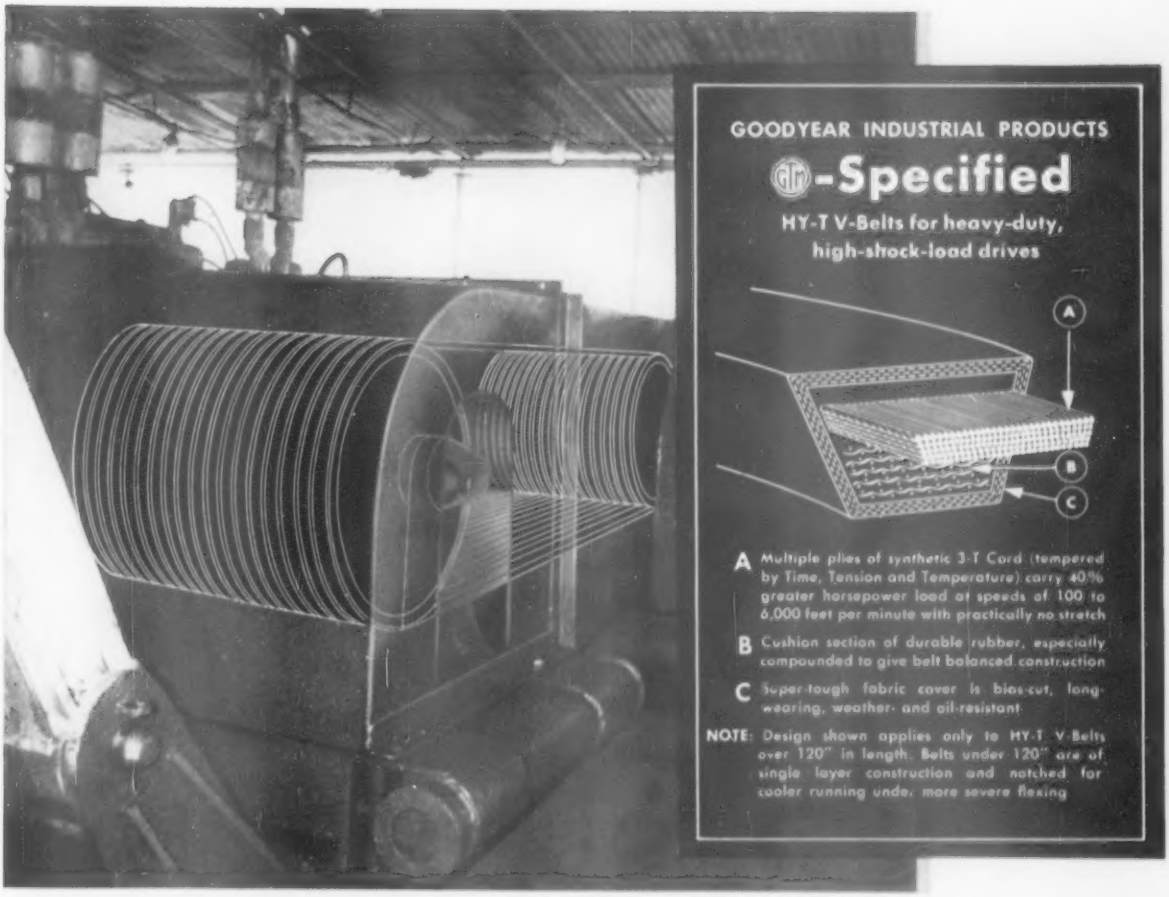
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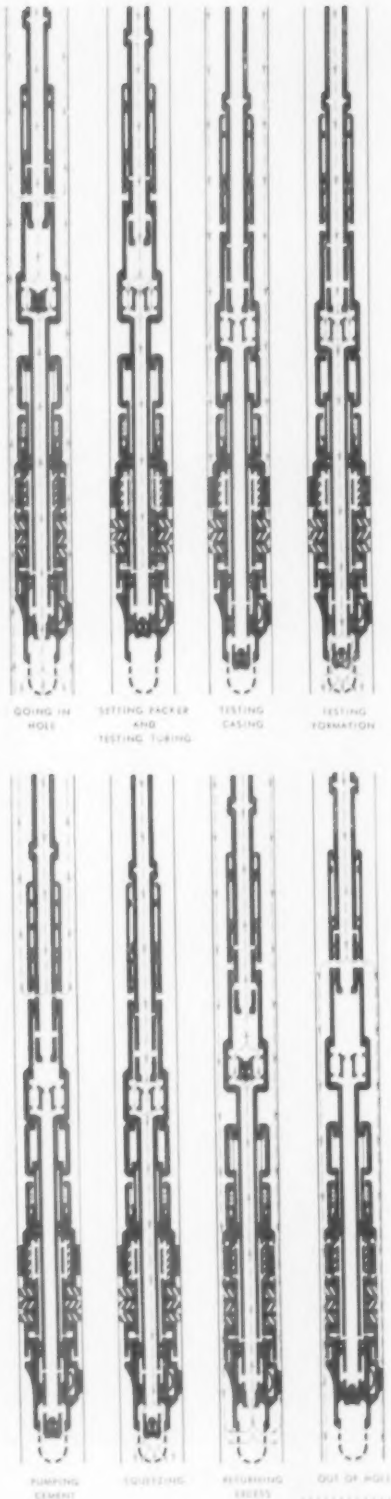

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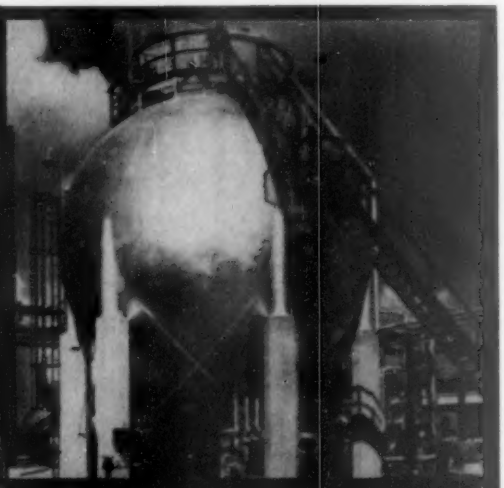

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A "low-salt" crude often contains solids such as sand, silt, rust and other plugging or abrasive materials to such a degree that they are more troublesome than salt.*

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Petreco desalting eliminates the hazard of water "slugs."

The storage of crude oils in the refinery often results in the deposition of "tank bottoms." These bottoms displace storage capacity, and cause an expensive disposal problem.

With Petreco desalting in the refinery, tank bottoms can be metered into the crude charge and easily disposed of.

*In one refinery, usually charging crude containing only 5 ptb, Petreco desalting showed a rapid pay out solely on the basis of solids removed.

6 REASONS WHY PETRECO DESALTING IS PREFERRED BY SO MANY LEADING REFINERS

1 Highest salt removal efficiency

2 Only all-electric desalting process

3 Desalts all types of crude

4 All basic equipment is designed by Petreco and furnished by Petreco

5 Petreco guarantees results and treating costs

6 Petreco desalting service staff offers know-how and facilities unequalled in the desalting field.

Be sure you get all the facts on the Petreco Electric Distillate Treating Process:

ELECTROFINING

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A DIVISION OF PETROLITE CORPORATION

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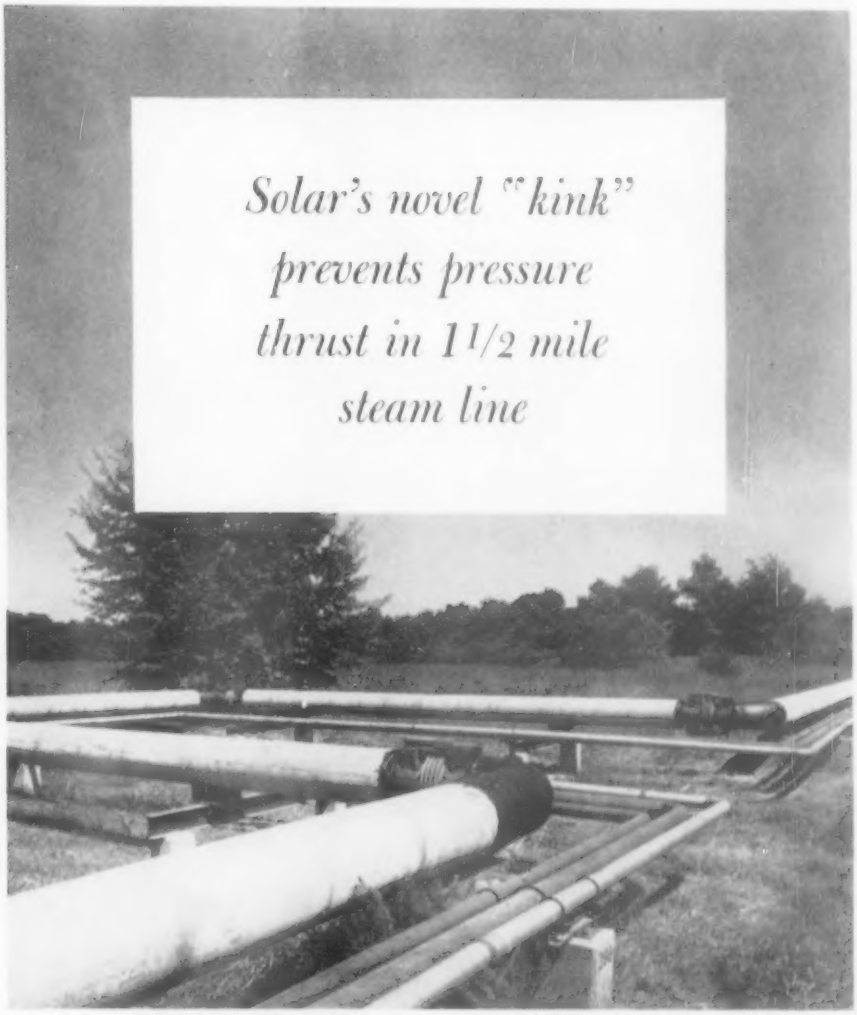
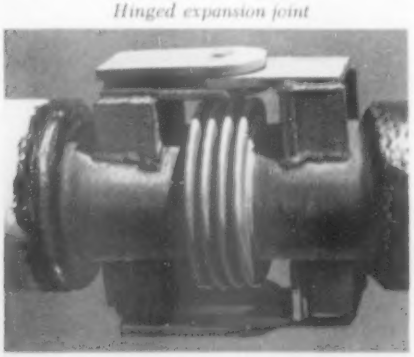
05-9



Solar's novel "kink" prevents pressure thrust in 1 1/2 mile steam line

THIS HINGED EXPANSION LOOP was designed by Solar engineers to solve an unusual problem at Lion Oil Company's Barton Plant, in Luling, La. The steam line shown above runs more than 1½ miles, operates at 200 psi and a temperature of 560 F. The problem was to stop pressure thrust and accommodate a large amount of pipe expansion.

Hinged expansion joint



The expansion loop employs four Sola-Flex hinged bellows joints, each requiring only 4 degrees of angulation. Yet three of these loops permit *twenty-seven feet of expansion*, thus accommodating the expansion of the entire 1½ mile steam line!

Experienced Solar engineering teams are always ready to help solve your high and low pressure piping problems. And Solar can follow through – with standard or custom-built expansion joints and convoluted couplings for all your piping needs. Send for Sola-Flex catalogs today.

SOLAR AIRCRAFT COMPANY — SAN DIEGO, DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS OF METAL ALLOY PRODUCTS

This is What Solar Offers You

When heat, corrosion or difficult specifications are problems, Solar can help you solve them. Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field.

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Gas Turbines. *Solar "Mars"® 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ½ in up to the world's largest, 28 ft in diameter.*

Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

CONTRACT PRODUCTION

Current orders include aircraft engine and airframe parts, pneumatic ducting, atomic energy components. Customers include the finest aircraft and industrial companies in the U.S. and Europe.

Plants. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

Services. *Research, design, development and production engineering staffs. Experienced with all alloy steels, stainless alloys, super alloys, and titanium and its alloys.*

Facilities . . . *for all types of metal fabrication—forming, machining, welding, brazing, casting, coating. Equipped for prototype, limited or mass production. Extensive laboratories. Complete quality control.*

INFORMATION

For more information regarding any Solar product or service listed above, write Solar Aircraft Company Department B-69 San Diego 12, California

GOING PLACES *in the roaring jets with Cities Service...*

The gargantuan, ever-growing thirst of the military jet planes was slaked last year by 124,000,000 gallons of Cities Service jet fuels. Cities Service refineries are geared to provide increasing quantities of vital defense matériel.

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All purpose packer for *all* producing problems.

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Simplest, shortest, safest, retrievable, drillable.

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Eliminates outside service crews, zones comingling, killing well and pulling tubing, disturbing packer setting.

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New, simple in design and operation, retrievable. Economical, sets automatically, needs no surface manipulation or tubing weight.

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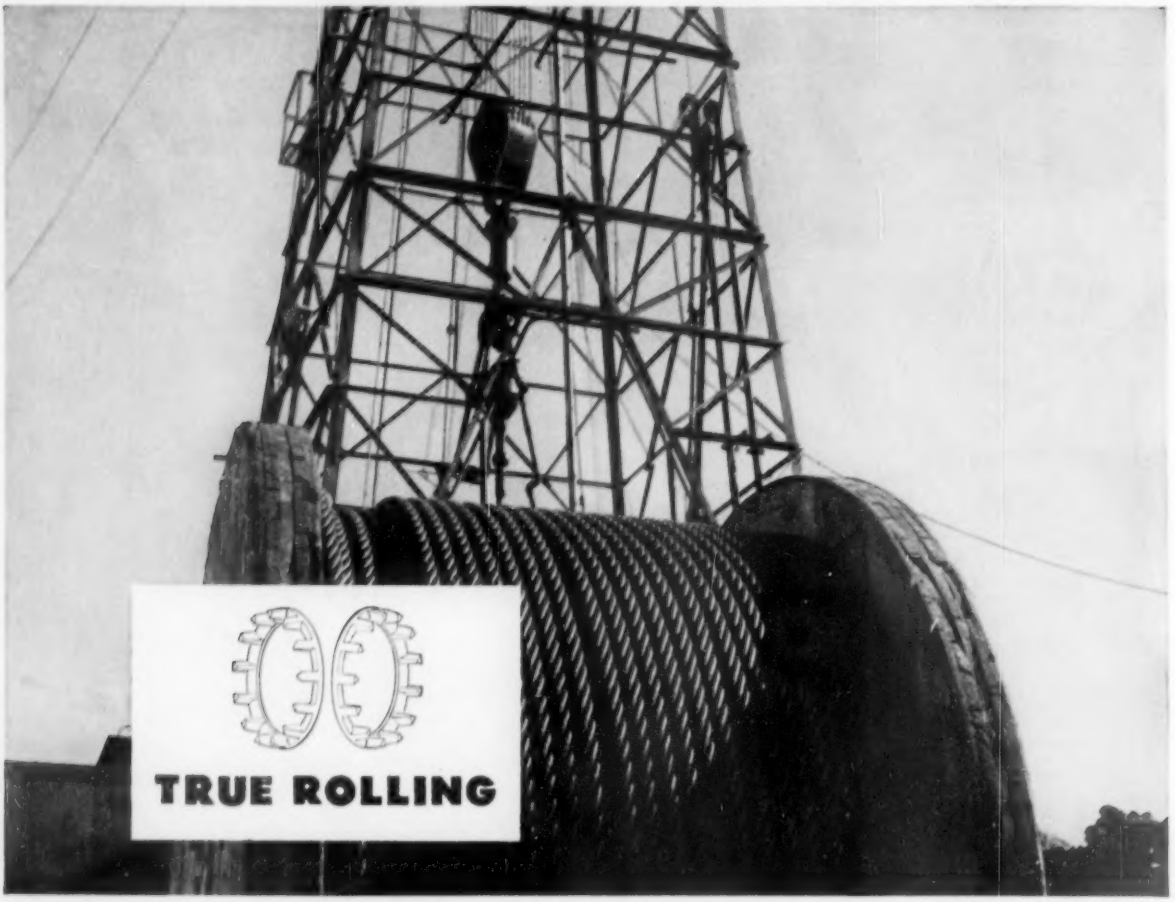
BROWN IS *FIRST* WITH THE BEST EQUIPMENT

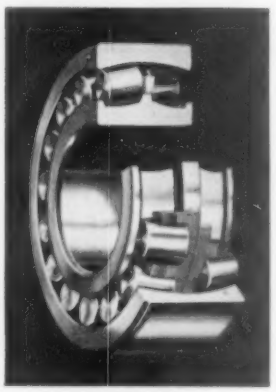
IN THE OIL INDUSTRY, TORRINGTON *Bearings are used in many applications including slush pumps, rotary tables, draw works, blocks, swivels and pumping units.*



Courtesy of the Ohio Oil Co.

TORRINGTON Spherical Roller Bearings

are designed with machined, cast-bronze, land-riding cages—one for each path of rollers—to assure true rolling operation



Other TORRINGTON SPHERICAL ROLLER BEARING features are equally important in assuring top performance. Contact surfaces are precision ground for even load distribution, long bearing life. Rollers and races are carefully heat treated to give maximum resistance to shock and wear.

An integral center flange gives positive radial stability and accurate positioning of thrust loads—an essential factor for longer service life. Contact surfaces possess geometrical conformity, giving ultimate load carrying capacity.

These are reasons why TORRINGTON SPHERICAL ROLLER BEARINGS give you long, low-maintenance service in the toughest, heavy-duty applications. Get the most for your bearing dollar—specify TORRINGTON.

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TORRINGTON SPHERICAL ROLLER BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller • Needle • Ball • Needle Rollers

This is trouble...

A seat and ball must have metallurgical stamina and the two must have mechanically perfect mating. If not, the photo shows what happens. Fluid under extreme pressure, containing corrosive, abrasive and other foreign matter, will cause fluid cutting of the seat and disintegration of the ball. A wrong specification of parts for a specific well condition might well be the cause of this failure.

Believe it or not, seat and completely split ball from a pump in a West Texas field. Photo unretouched.

This is trouble-free...

Here's why . . . Design, metallurgy and manufacturing, each are vital factors in the Axelson end product. Each micro-finished ball is precision fit to each of the two precision-ground seating surfaces of the seat. Seat and ball become a matched pair. For your further protection, an Axelson expert is at your service to analyze your well condition and recommend the correct combination of Axelson pumping equipment.

To minimize production problems . . **AXELSON** *Seats and Balls*

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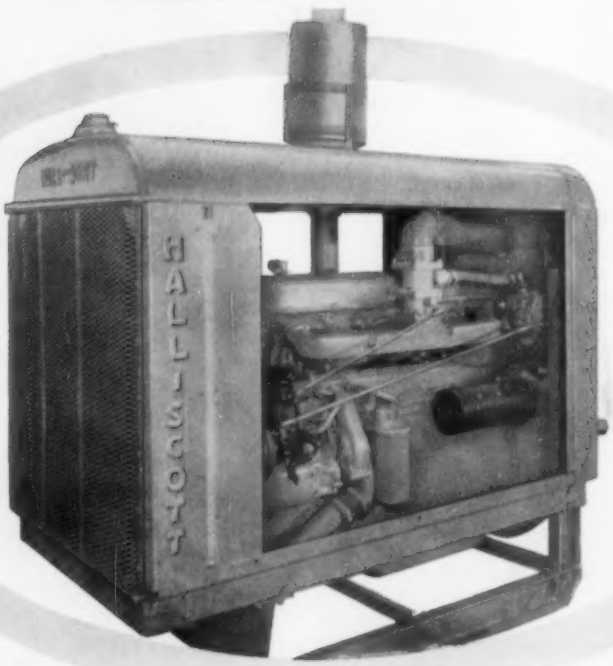
A GREAT NEW ENGINE

The new Hall-Scott model 590 brings to the petroleum industry new standards of power and performance, with all the exclusive Hall-Scott features of design and construction. More than 200 HP . . . less than 6 pounds per HP . . . for gasoline or LPG. Get complete information on the full line of Hall-Scott engines for petroleum industry services from your nearest dealer.

Hall-Scott Motors Company
Berkeley 10, California



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NEW SX SERIES

BREWSTER

OIL BATH SWIVELS

NEW HIGH CAPACITY—
LOW UP-KEEP

Years ahead in engineering and design, Brewster Swivels have a proven record in the field for low maintenance cost, easy packing replacement and long bearing life. Their exceptional operating record is the result of Brewster's careful attention to even the smallest engineering detail. Now, further improved for longer life and higher capacity—only Brewster swivels have these features:

EXTRA HEAVY DUTY TAPERED MAIN BEARING
TWO OVERSIZED ALIGNMENT BEARINGS
ADJUSTABLE BALL TYPE UPTHRUST BEARING
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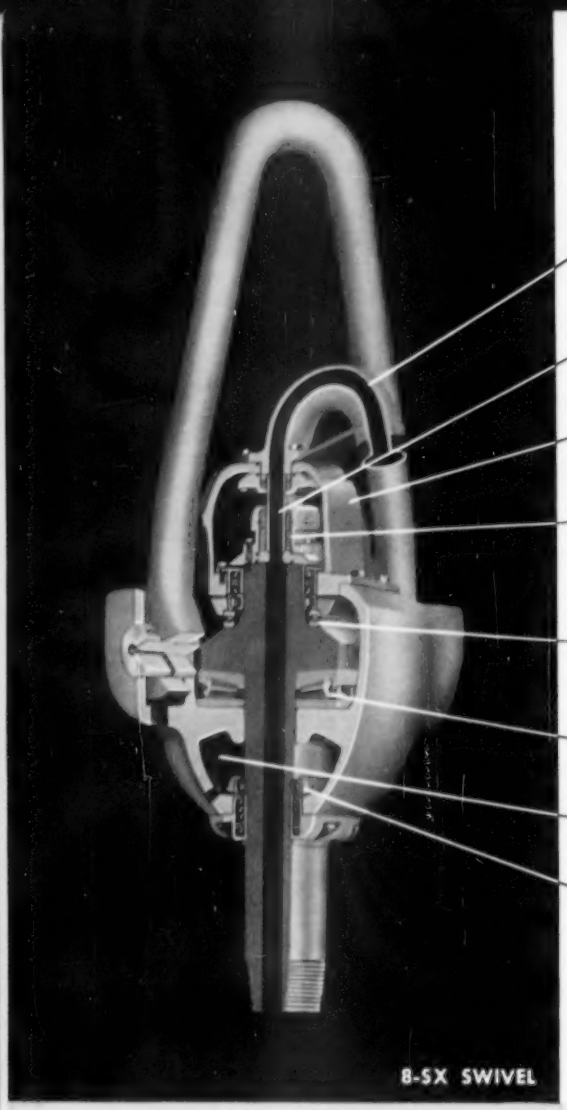
PATENTED SLIP-OUT PACKING CARTRIDGE
STREAMLINED CAST STEEL BODY
WIDE RANGE OF FIELD-PROVED SIZES

Ask your supply house for additional information on Brewster Swivels—or write to us direct.

BREWSTER SWIVELS

BREWSTER DRILLING EQUIPMENT

THE BREWSTER COMPANY, INC.



INSIDE FACTS . . . ON BREWSTER OIL BATH SWIVELS

GOOSENECK full radius design eliminates turbulance and cavitation — washpipe and packing can be replaced without removing gooseneck or rotary hose.

WASHPIPE machined from seamless tubing that has been hardened and highly polished for maximum resistance to wear and abrasion.

BONNET cast steel tripod-type bonnet has been heat treated for extra strength and rigidity — legs are positioned at points of greatest stress.

SLIP-OUT PACKING CARTRIDGE patented design, quickly removed from either side of swivel — no special tools required — elements lubricated from an external Alemite fitting.

UPTHRUST BEARING double acting ball-type upthrust and hold-down bearing is adjustable to compensate for main bearing wear.

TAPERED MAIN bearing extra heavy duty — exceeds rated swivel capacity.

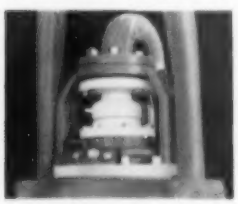
LUBRICATION. All rotating parts are submerged in a bath of oil — unique body design causes cool oil to be force circulated through bearings as the swivel rotates.

ALIGNMENT BEARING. Two oversize roller alignment bearings are widely spaced on the stem assuring its vertical stability.

NEW . . . PATENTED SLIP-OUT PACKING CARTRIDGE

The only swivel packing that combines economical replaceable packing elements with an easy to change, cartridge design.

Washpipe or packing can be changed quickly in three easy steps . . .



1. *Unbolt top and bottom flanges (bonnet and gooseneck are not removed).*

2. *Slip packing cartridge and washpipe out from side of swivel.*

3. *Remove and replace worn packing elements.*

BREWSTER OIL BATH SWIVELS

New high capacity design for every drilling depth.

300 TONS 8SX

200 TONS 6SX

100 TONS 4SX

50 TONS 3S

THE BREWSTER COMPANY, INC. SHREVEPORT, LOUISIANA

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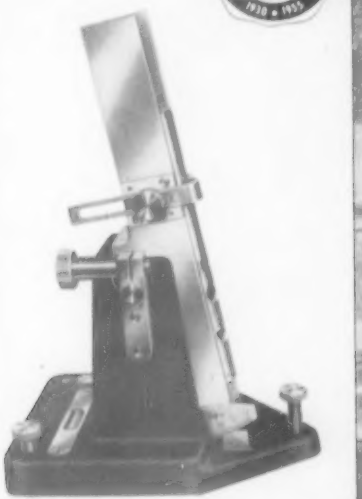
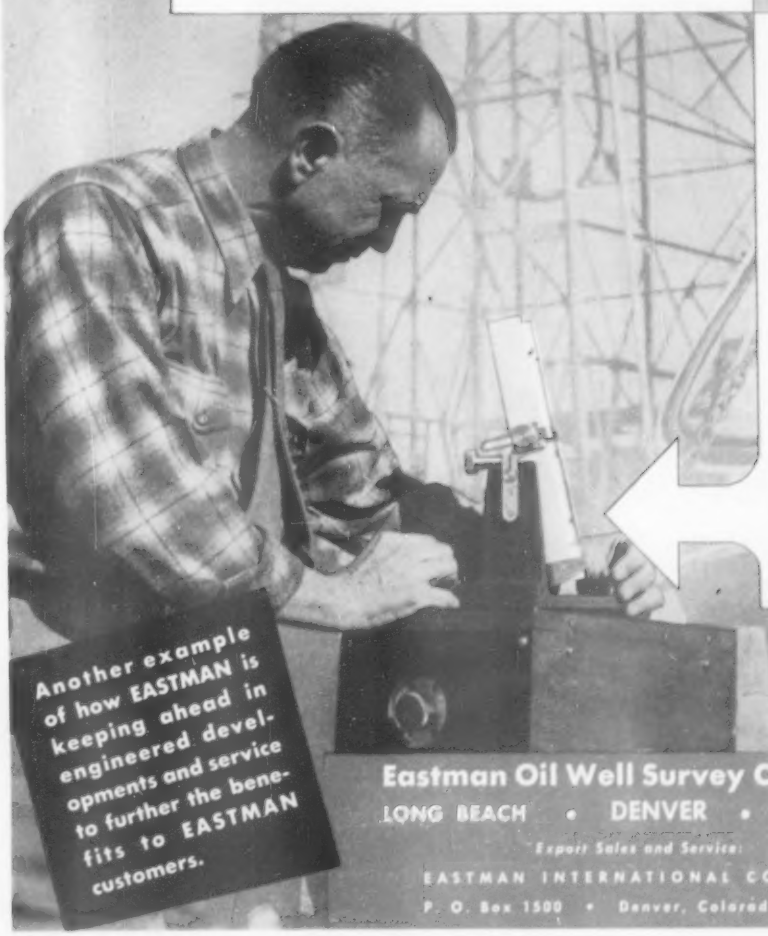
Beyond a shadow of a DOUBT...

Another EASTMAN FIRST developed by EASTMAN Engineers!

Regular field checks for continued accuracy of EASTCO DRIFT INDICATORS is now possible with the use of the new EASTMAN Portable Test Stand.

Its use is proof beyond a shadow of a doubt to the operator that the precision EASTCO DRIFT INDICATOR is recording accurately.





Another example of how EASTMAN is keeping ahead in engineered developments and service to further the benefits to EASTMAN customers.

Eastman Oil Well Survey Company

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Export Sales and Service:

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Best today...better tomorrow. For more than 60 years of specialized manufacturing experience...through the development of the most important firsts in the business, Jones has put together the knowledge, plant and machines to produce the best sucker rods and couplings you can use.

We're still not satisfied! Today and tomorrow, our engineers and researchers in field and factory are working to better our products. Our goal is your satisfaction.

LOOK FOR THE GREEN RODS

JONES SUCKER RODS

last longer!

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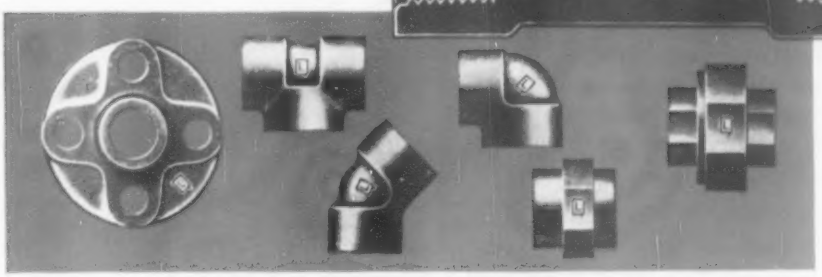
LUNCOR PVC VALVES REPLACE HIGH-ALLOY VALVES

Also Replace Valves Lined With Glass, Porcelain, Stoneware, Hard Rubber At Substantial Savings

LUNCOR is the first all-molded PVC valve designed and engineered by a valve manufacturer. LUNCOR PVC is a strong, rigid type of unplasticized polyvinyl chloride. The valve design has been created to take full advantage of the properties of PVC. LUNCOR PVC can be molded to precise tolerances and is remarkably corrosion-resistant, odorless, tasteless, non-toxic, non-porous, non-contaminating, and weighs only one-sixth as much as metal. The new valve, with its full line of fittings, permits ready installation of complete plastic piping systems.

Every part is made of all molded LUNCOR PVC . . . body, bonnet, disc, stem, and handwheel. Packing is self-lubricating Teflon.

FIG. 2600
125 WP
140°F.



LUNCOR FITTINGS

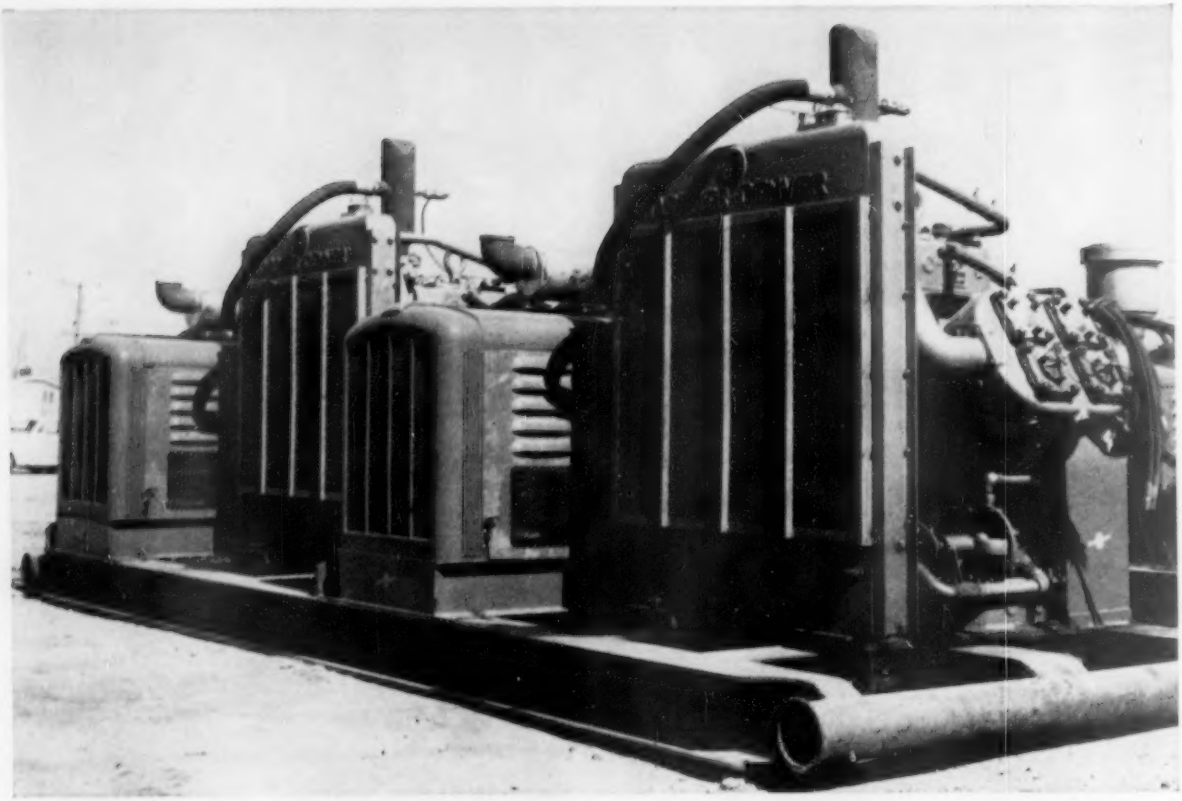
The complete line of fittings which complements the new LUNCOR Valve includes: caps, couplings, plugs, unions, reducing bushings, flanges, elbows, and tees. LUNCOR Fittings are made of the same high-quality rigid polyvinyl chloride as the Lunkenheimer LUNCOR Valve.

REQUEST LITERATURE FROM YOUR LUNKENHEIMER DISTRIBUTOR OR FROM THE LUNKENHEIMER COMPANY, BOX 360, CINCINNATI 14, OHIO.

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-255-16



Skid mounted Gardner-Denver WBK air compressors in use on a West Texas air drilling operation.

To drill faster with air they're using Gardner-Denver air

In the Southwest, they're finding that air drilling means faster penetration—makes bits last longer—keeps production up and costs down. And they're finding, too, that Gardner-Denver air compressors—both portable and stationary—provide an always-dependable air supply. Gardner-Denver compressors, available in a wide range of capacities, provide the right air pressure for any underground condition. Write for details.

Seven Gardner-Denver 500 diesel portable compressors in preliminary air drilling tests for a large oil company.

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How Sheffield Steel Serves a Booming Market

The Liquefied Petroleum industry is flashing one of the most phenomenal growth records on the industrial scene today. From one million in 1940, consumers of this heat-rich, clean fuel have multiplied to nine million.

Along with matching Sheffield steel plate for forming into tank shells, the deep drawn, semispherical Sheffield tankheads pictured go to tank manufacturers across the nation.

The uses of LP gas are numerous and expanding. On the farm, it performs such chores as cooking, heating, refrigeration, machinery and tractor propulsion, crop drying and weed-burning—and now air conditioning.

In addition to this growing LP gas market for these pressure vessels made of Sheffield steel components, another big potential market looms up in the handling of liquid fertilizer. It seems a certainty the demand for pressure vessels will continue. If you have an active interest in this booming industry let us tell you how we can serve your need.

Look to Sheffield

for Quality Carbon and Alloy Steels Needed In Products of Your Manufacture—Ingots, Blooms, Billets, Plate, Structurals, Merchant Shapes, Manufacturers Wire, Bolt and Nut Products, including Structural Bolts.

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ARMCO STEEL CORPORATION
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SUN'S NEW CAT CRACKERS WILL DELIVER BTU TO B&W-OXY-Catalyst Boilers

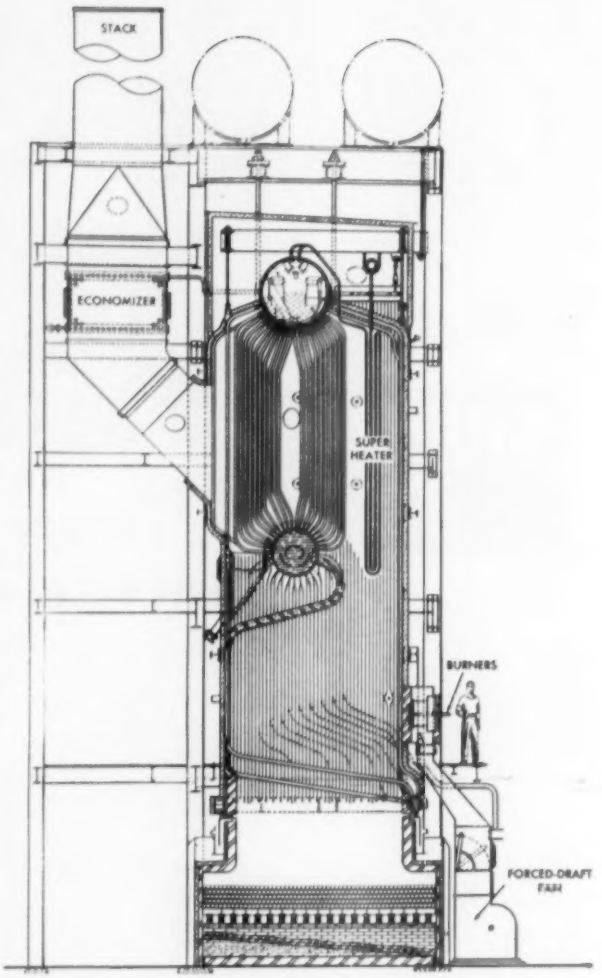
Sun Oil has undertaken an important program of efficiently utilizing the millions of Btu generated in the operation of its catalytic cracking units. Through the use of a new platinum oxidation catalyst, manufactured by Oxy-Catalyst, Inc., the combustibles in the gas streams leaving Sun's new Houdriflow units will be completely burned and the heat absorbed by B&W-Oxy-Catalyst Boilers; thus Sun Oil will save thousands of dollars annually.

Two years ago Sun installed Oxy-Catalyst elements in the exhaust gas stream of one of their fixed bed Houdry units, and proved the feasibility of using the platinum catalyst to burn the combustibles in the cracking unit exhaust gas stream.

This development work resulted in the installation of a Babcock & Wilcox Boiler in Sun's Toledo Refinery especially designed for operation with an Oxy-Catalyst bed. The B&W-Oxy-Catalyst Boiler absorbs the heat from a new Houdriflow cracking unit exhaust gas stream after the combustibles in this stream have been completely burned in the Oxy-Catalyst bed. This unit went on stream in May 1955. A duplicate unit has been completed at Sun's Marcus Hook, Pennsylvania, Refinery, and started operation June 1955.

The Sun Oil Company is spending large sums in its efforts to prevent air contamination and to recover valuable heat otherwise lost to the atmosphere in the air used for catalyst regeneration. The Babcock & Wilcox Company is happy to work with the Sun Oil Company and Oxy-Catalyst, Inc., in this new development which not only accomplishes important fuel savings but also establishes control over the discharge of contaminants to the atmosphere.

The boilers just described are the first of their kind to be installed. Sun Oil also placed one of the first B&W "CO" boilers in operation early in 1954. These boilers burn the combustibles in cracking unit exhaust gas streams by burning supplementary fuel to maintain the proper temperature for combustion in their furnaces. The Babcock & Wilcox Company, therefore, is prepared to quote on and build all types of cracking unit exhaust gas boilers, conventional waste heat, Oxy-Catalyst Boiler or CO Boiler, whichever is necessary to meet your steam and process requirements.



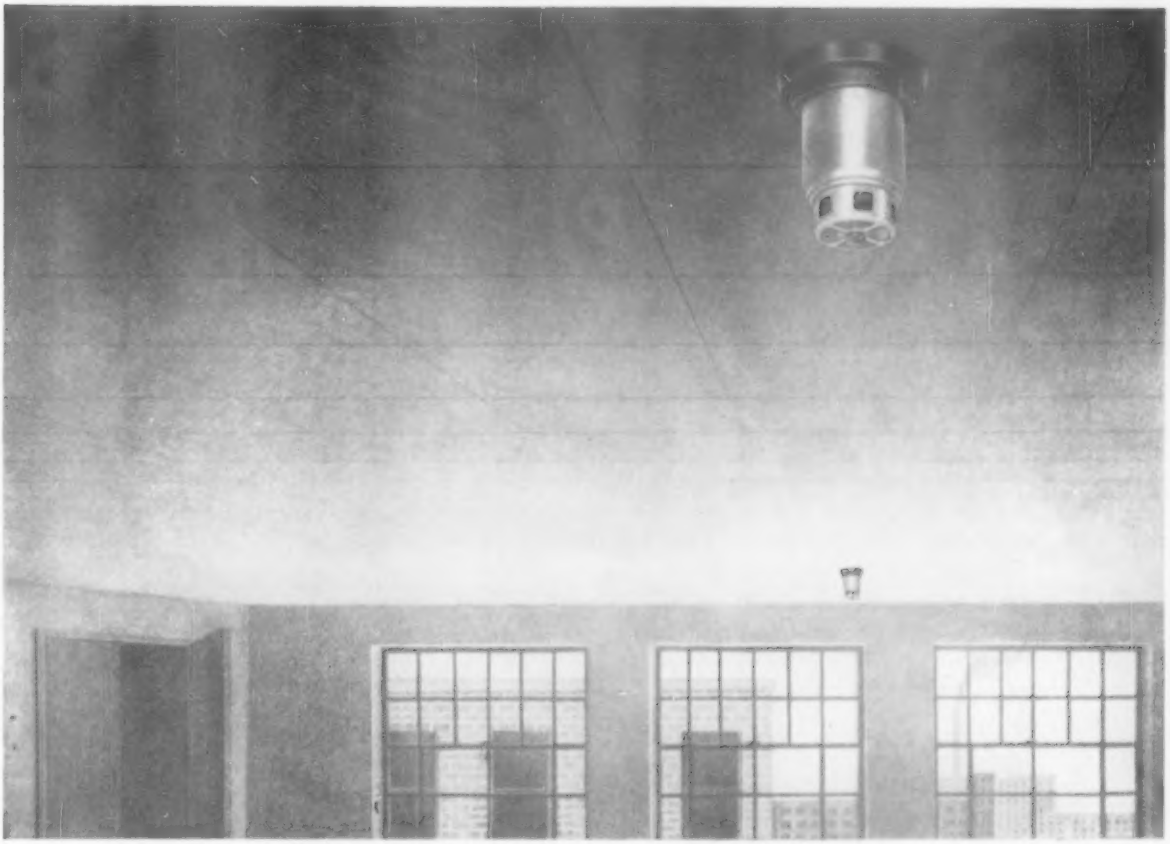
SECTIONAL VIEW OF THE CO BOILERS AT TOLEDO AND MARCUS HOOK

BABCOCK & WILCOX
BOILER DIVISION

G-720

New, radio-active, automatic fire guard!

C-O-TWO PRE-DETECTOR SYSTEM



Each pre-detector head protects up to 3,600 square feet of area . . . harmless radio-active element utilizing ionization chamber principle quickly detects all forms of fire . . . requires only simple two-wire circuit and insignificant wall space for controls.

This completely new and positive means of spotting fire is just what you've always needed and wanted . . . detects in the earliest stage, invisible combustion gases, visible smoke, slow smoldering, as well as open flame. The C-O-TWO Pre-Detector System is simple to install, extremely economical to maintain and doesn't depend on thick smoke or heat for actuation.

As many pre-detector heads as necessary can be connected together in a single circuit and up to 16 separate circuits or spaces handled by one system. With a single circuit the pre-detector heads are connected directly to the fire indicating cabinet, while with multiple circuits the pre-detector heads are first connected to one or more space indicating cabinets capable of visually showing by number the exact location of the fire. Relays perform such functions as sounding alarms, closing fire doors, shutting down ventilation and releasing fire extinguishing systems.

The C-O-TWO Pre-Detector System has been subjected to extensive testing and carries Underwriters' Laboratories, Inc. listing, as well as Factory Mutual Laboratories approval. Proven pilot installations have been made in such diversified properties as a television station, an electric power company network analyzer room, a railroad signal tower, an airline flight training equipment room and the offices of an insurance company.

Don't take unnecessary chances any longer . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts about this new C-O-TWO Pre-Detector System today!

Pyrene

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portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

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How much is your annual bill for drilling lines?

HOW TO STOP A LEAK

You don't buy drilling lines with petty cash. Wire rope costs the drilling industry millions annually . . . one reliable estimate is $100,000 a day!

The heavy end of this million-dollar burden is carried by rotary and cable tool men using conventional lines.

Wire rope can be less expendable. Let us tell you briefly about SpringKore and PlastiKore.

The heart of a SpringKore rotary drilling line is a tightly coiled steel spring, packed with lubricant against rust and wear.

The high-carbon cold-drawn steel spring center will flex without crushing. You get a uniform line that stays that way under very trying conditions.

With a SpringKore line you can operate with a confidence you never felt before.

PlastiKore cable tool drilling lines have a polyvinyl center that is permanently firm and flexible.

It guards against internal corrosion—absorbs no moisture.

Even acids do not affect it.

You get a uniform line with a tough, firm center that never pulls down.

Ask any J&L man for a list of drillers in your area who have stopped a major maintenance leak with SpringKore or PlastiKore.

J&L STEEL

PESA
PARTNERS IN PETROLEUM PROGRESS

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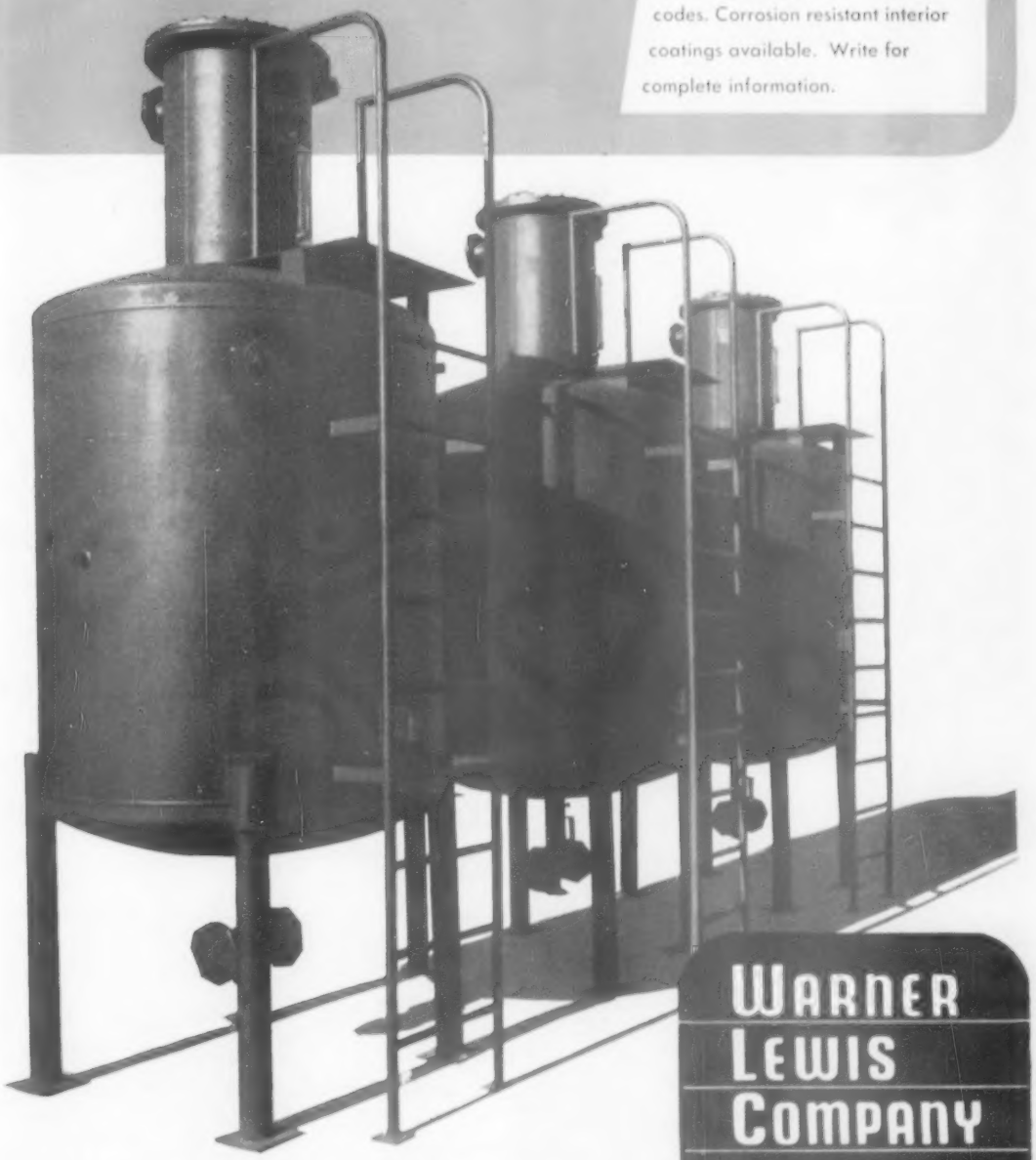
STEEL CORPORATION
SUPPLY DIVISION—TULSA, OKLAHOMA
Serving The United States and Canada

104-S

large capacity pipeline meter calibrating tanks

Let our years of experience in the design and fabrication of these tanks help in your planning of meter calibrating tank installations.

Built to API code 1101 (tentative) and API-ASME codes. Corrosion resistant interior coatings available. Write for complete information.

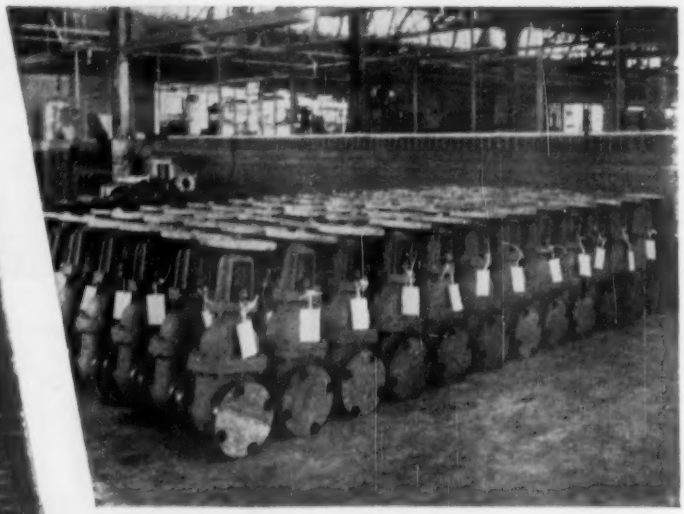


WARNER LEWIS COMPANY

DIVISION OF FRAM CORPORATION

BOX 3096 • TULSA, OKLAHOMA

VALVES and FITTINGS for the OIL and ALLIED INDUSTRIES



Specialists in the manufacture of:—

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All types of Oil Valves and Fittings for:—

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LONDON OFFICE: WHITT & CHAMBERS LTD.

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None other like it!

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TRIOFLEX Rotary Hose

Designed for portable drilling units, workover rigs and seismograph work, Thermoid Trioflex Rotary Hose gets the job done faster. It's light, flexible, easy to handle, and kink-resistant. And its brute strength means longer wear . . . fewer replacements.

Study its cross section view:

- Synthetic rubber tube resists oil and abrasion
- Braided steel wire reinforcement adds strength and flexibility
- Tough, specially compounded cover resists abrasion and aging

Every length pre-tested to 2000 psi

Furnished in three sizes:

2″—with 2″ male couplings, API threads

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Get Trioflex and other Thermoid oil field products listed below from your supply house or from one of the Thermoid warehouses located in:

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* Special pressed-on couplings are an exclusive Thermoid design. Anchored securely . . . guaranteed for life of hose.

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This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

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'L' SERIES PUMPING UNIT

Now in production, the LEGRAND "L" SERIES of pumping units contains a model to meet every need in mechanical pumping (from 4,000 lbs. to 25,000 lbs. polished rod load and 24" to 72" stroke) incorporating up-to-date design features derived from many years of practical field experience.

DESIGN FEATURES

- Floor-clearing Cranks.
- Rack-and-Pinion Balance Weight adjustment.
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- LEGRAND Patent Double-Taper Wristpins.
- Self-aligning Equalizer Wristpin Bearings.
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- Swing-back Mulehead.
- LEGRAND Patent Carrier Bar.
- Central-point Lubrication.
- All bolting in "unified" series.

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Where do you NEED IT ?

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WHERE YOU WANT IT
WHEN YOU NEED IT...
AT REASONABLE
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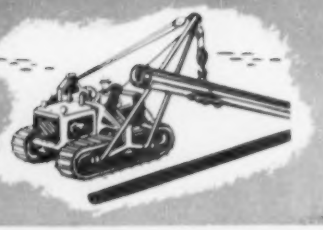

THE Bovaird SUPPLY COMPANY
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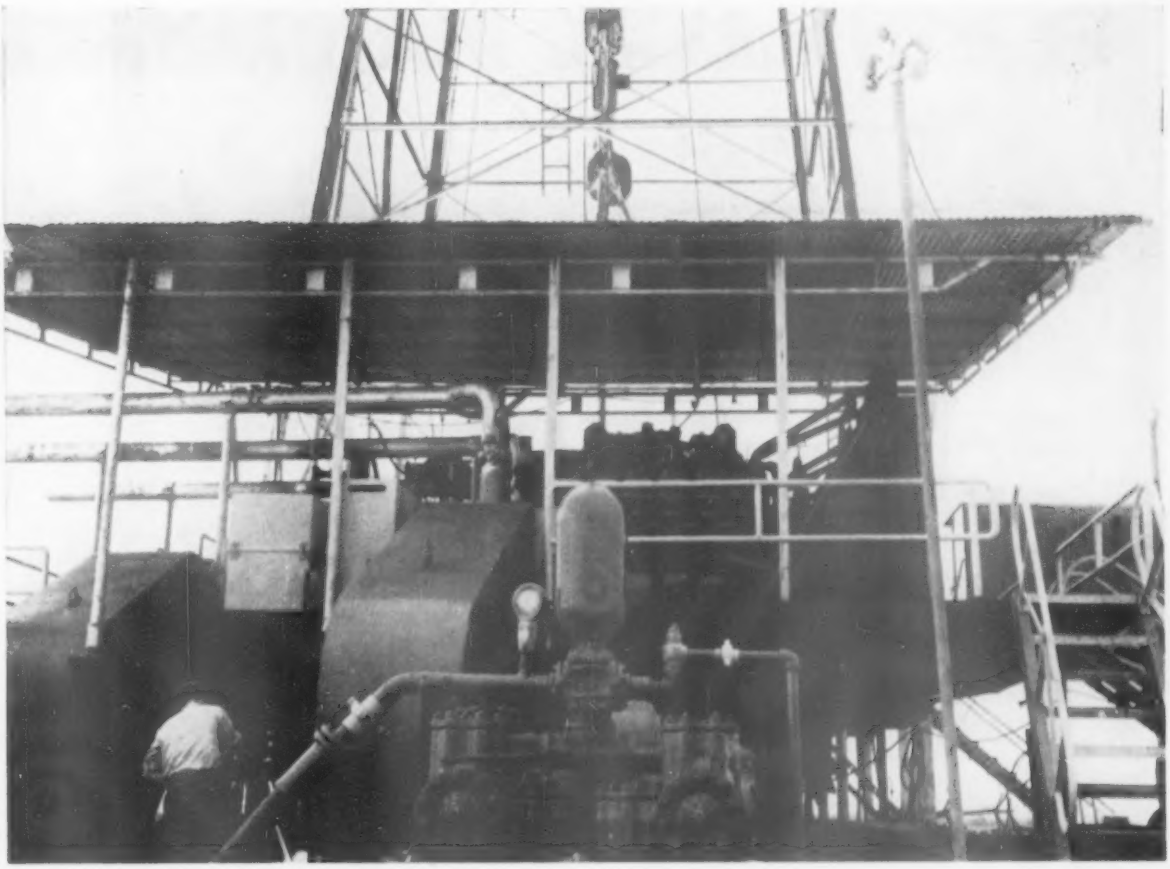
84 YEARS OF PROGRESS WITH THE OIL INDUSTRY



Deephole Drilling . . . In a Hurry !

. . . the acceleration, lugging power, and dependability you get from Le Roi L3460 and L4000 engines mean faster round trips and lower drilling costs.

WHEN you have to go deep you need plenty of horsepower. And the place to get it is from Le Roi's L3460 with 600 max. hp. or its big brother, the L4000 with 655 max. hp.

You get much more, too. You get compactness. These V-12 overhead-valve engines are only 164 in. long. That makes them ideal for drill-rig installation, because they pack a lot of power in a small space — give you more horsepower per dollar.

But that's not all you get from these high-output engines. They represent the first, truly new design concept in 15 years. They have improved fuel economy; integral crankcase and cylinder construction for greater rigidity; longer bearing life; hydraulic valve lifters; better manifolding; husky crankshaft with integrally forged counterweights for unbelievably smooth operation — modern features that mean lightning response to load demands, outstanding performance and dependability.

Like all Le Roi engines, they're built to stand oilfield handling; they're easy to service; they have a wide speed range up to 1350 rpm; and they operate on natural gas, butane, or gasoline.

Ask your supply house or Le Roi distributor to show you an L3460 or L4000 at work. See for yourself why they can help you make hole faster. Literature is also available — just write us for it.

P-133

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

PORTABLE AIR COMPRESSORS

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THE PIPE-LAYING PERFORMANCE

Allis-Chalmers presents —

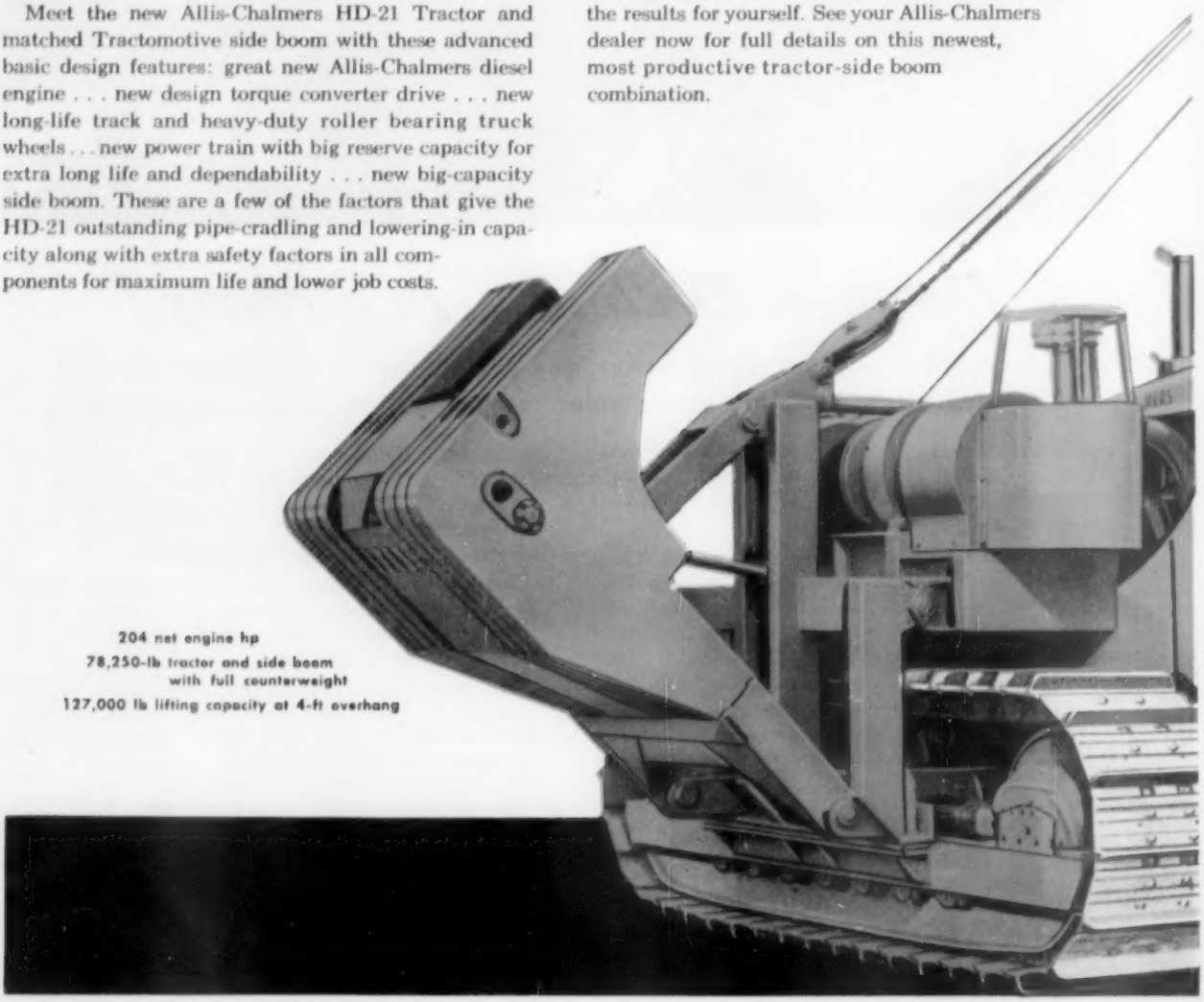
Tractomotive Side Boom

Bring on your super-inch pipe and bigger — bring on the toughest pipe-laying conditions anywhere — bring on your tightest completion schedules — yes, bring 'em all on and you'll beat 'em with the most advanced pipe-laying team ever to roll down a right-of-way.

Meet the new Allis-Chalmers HD-21 Tractor and matched Tractomotive side boom with these advanced basic design features: great new Allis-Chalmers diesel engine . . . new design torque converter drive . . . new long-life track and heavy-duty roller bearing truck wheels . . . new power train with big reserve capacity for extra long life and dependability . . . new big-capacity side boom. These are a few of the factors that give the HD-21 outstanding pipe-cradling and lowering-in capacity along with extra safety factors in all components for maximum life and lower job costs.

Make a spread-for-spread comparison

The real dollars and cents measure of tractor performance is output on the line. Put a spread of HD-21's on one section of your job — clearing right-of-way, cradling and lowering in pipe, backfilling, clean-up. Judge the results for yourself. See your Allis-Chalmers dealer now for full details on this newest, most productive tractor-side boom combination.



204 net engine hp
78,250-lb tractor and side boom with full counterweight
127,000 lb lifting capacity at 4-ft overhang

LEADER STEPS AHEAD AGAIN!

— the new HD-21 Tractor with

Allis-Chalmers — Pacemaker in Pipe-Line Tractor Progress

New ideas, pioneered by Allis-Chalmers, have played an important part in today's safer, more productive tractor-side boom combinations. Here are some of the *tested and proved* advances you get on Allis-Chalmers tractors and side booms.

- **Torque Converter Drive** — Allis-Chalmers introduced it in crawler tractors in 1940 and now stands behind a record of outstanding torque converter performance.
- **Outstanding Stability** — The HD-21 has outstanding flotation and stability with 84-in. center-to-center width, up to 28-in. track shoes and long, 7-truck roller track. This, plus hydraulically extendable counterweights that pivot at bottom, provide the balance and traction for booming out heavy loads. Racks and weights are mounted high for maximum clearance on narrow right-of-ways, or in deep mud. Safety linkage prevents counterweights from dropping.
- **Quick-On, Quick-Off Sectional Frames,** pin-connected for quick installation and removal . . . makes it easy to ship or service tractor.
- **Constant Mesh, Helical Gear Side Boom Transmission** — Four speeds for load line and boom control; one reverse speed for power lowering.
- **Sure-Gripping, Internal-Expanding Side Boom Brakes** — provide positive control of load and boom line drums. Completely enclosed from dirt and moisture.

Plus this combination of additional proved features you can't get from anyone but Allis-Chalmers at any price:

- All-Steel Box-A Main Frame
- Straddle-Mounted Final Drive Gears
- 1,000-Hour Truck Wheel Lubrication
- Oil-Enclosed Track Release Mechanism

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ALLIS-CHALMERS

Whether you require fast rotation drilling for crooked hole country or deep penetrating action for softer formations, there's a CP Bit for your exact needs. Chicago Pneumatic's complete line of Three Cone Rock Bits and Jet Bits includes seven different types for all kinds of formations from soft to exceedingly hard and abrasive.

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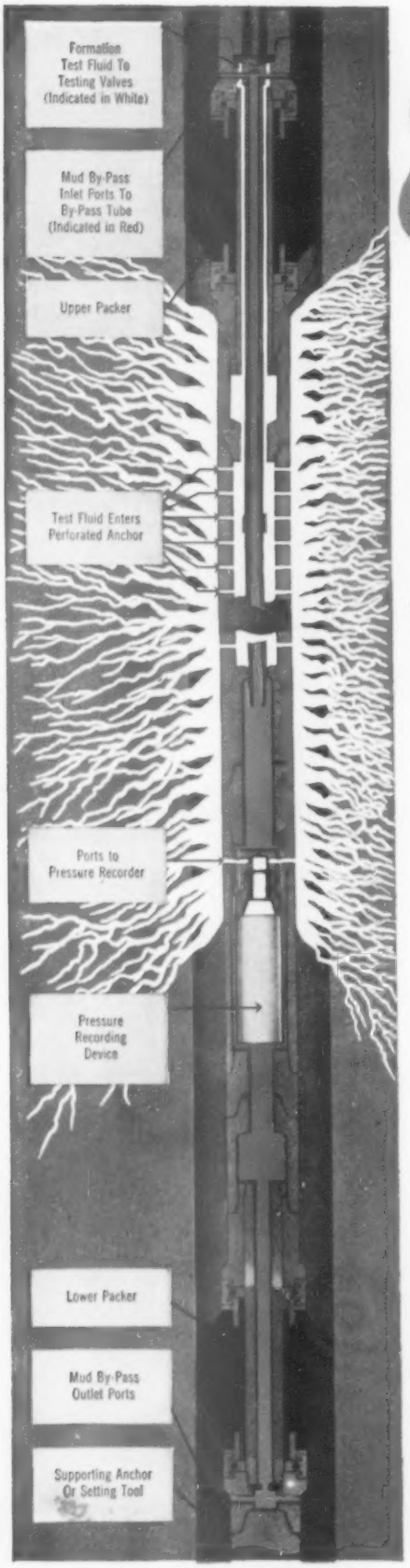
(Export Agent, exclusive of Mexico and Canada)


Formation Test Fluid To Testing Valves (Indicated in White)
Mud By-Pass Inlet Ports To By-Pass Tube (Indicated in Red)
Upper Packer
Test Fluid Enters Perforated Anchor
Ports to Pressure Recorder
Pressure Recording Device
Lower Packer
Mud By-Pass Outlet Ports
Supporting Anchor Or Setting Tool

Straddle Testing

in open hole

another Johnston first*

Now, with complete confidence, you can...

- **EVALUATE UP-THE-HOLE ZONES**
- **LOCATE GAS, OIL, AND WATER CONTACT**
- **HELP PROTECT HOLE AND SUPPORTING ANCHOR**

See how Johnston Straddle Testing with STRADDLE MUD BY-PASS maintains full hydrostatic mud pressure on upper and lower packers—and on all formations below lower packer. Lessens the load on supporting anchor and prevents production from any lower zone in the event of lower packer failure. Should either packer fail, you get an immediate surface indication. Get all these advantages plus ease of running tool into and out of the hole.

*Johnston Straddle Testing with Straddle Mud By-Pass is covered by patent and patents pending. Another Johnston first!

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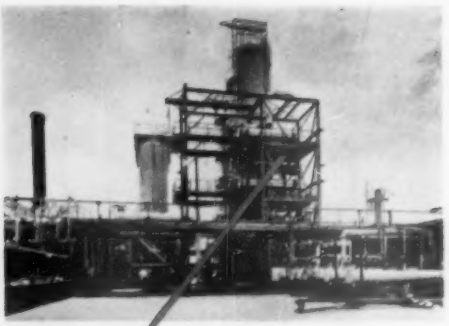
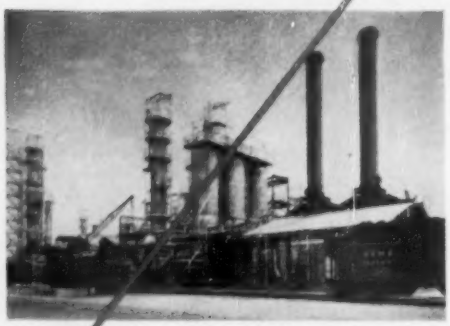
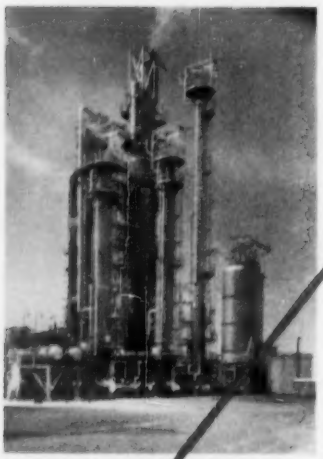
Another Complete Refinery



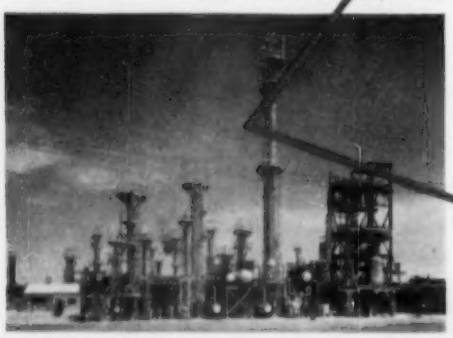
CRUDE UNIT: capacity 10,000 barrels per calendar day.



DELAYED COKING UNIT: 2,500 barrels a day reduced crude; produces approximately 74 tons a day of coke.



CATALYTIC CRACKING UNIT: capacity 7,000 barrels a day of total feed.



CATALYTIC POLYMERIZATION UNIT: capacity 1,700 barrels a day of mixed $C_3 - C_4$ stream.

CATALYTIC REFORMING: 3,500 barrels a day of heavy naphtha.

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NEW YORK • LONDON

Built for The Texas Company at El Paso, Texas, this new integrated refinery consists of crude and delayed coking units, as well as units for catalytic cracking, polymerization and reforming.

To companies the world over that now are contemplating new refinery expansion, Foster Wheeler offers the significant advantages of its worldwide experience in the design, engineering and construction of completely integrated refining facilities. For proposals to meet your specific requirements, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

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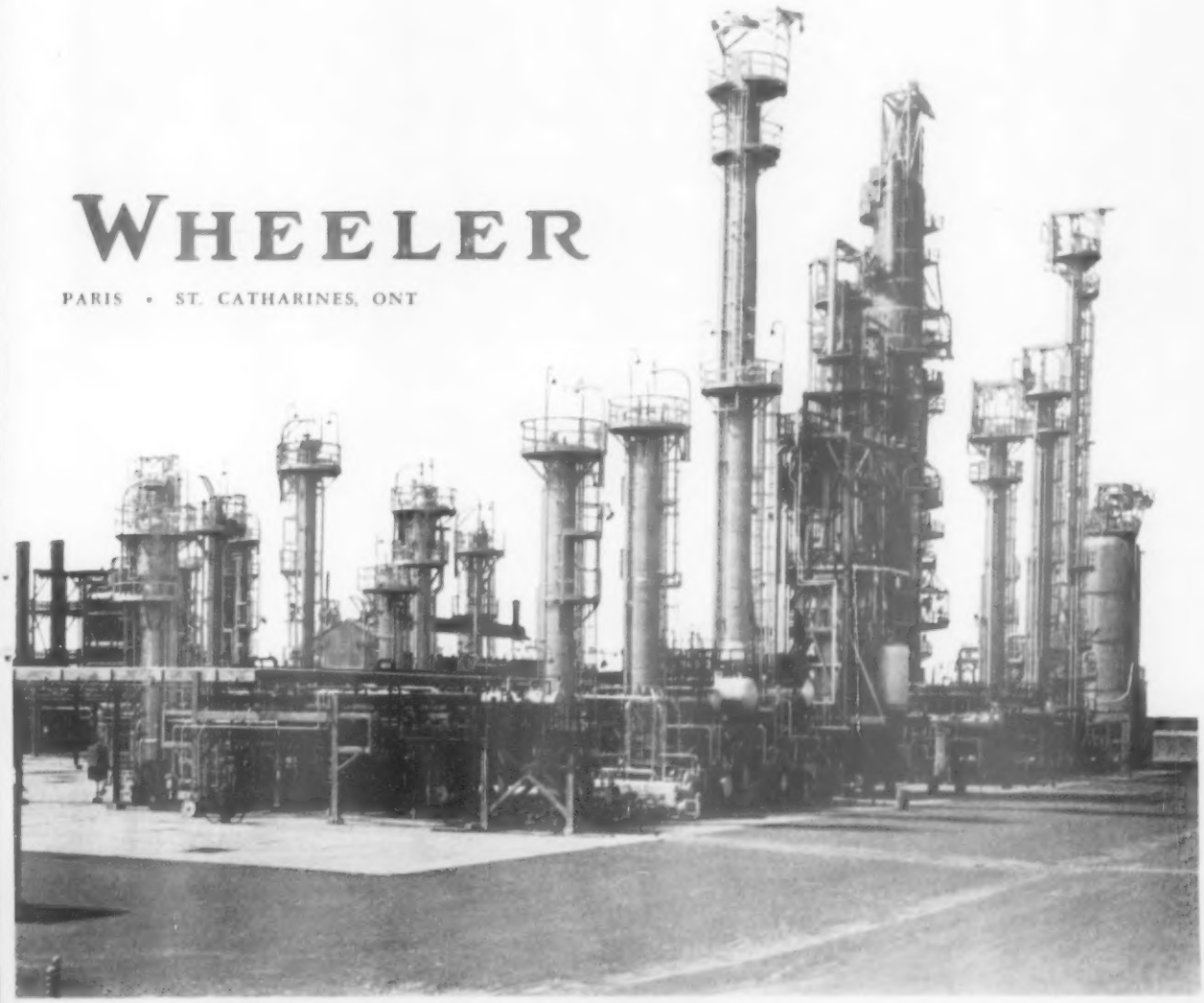
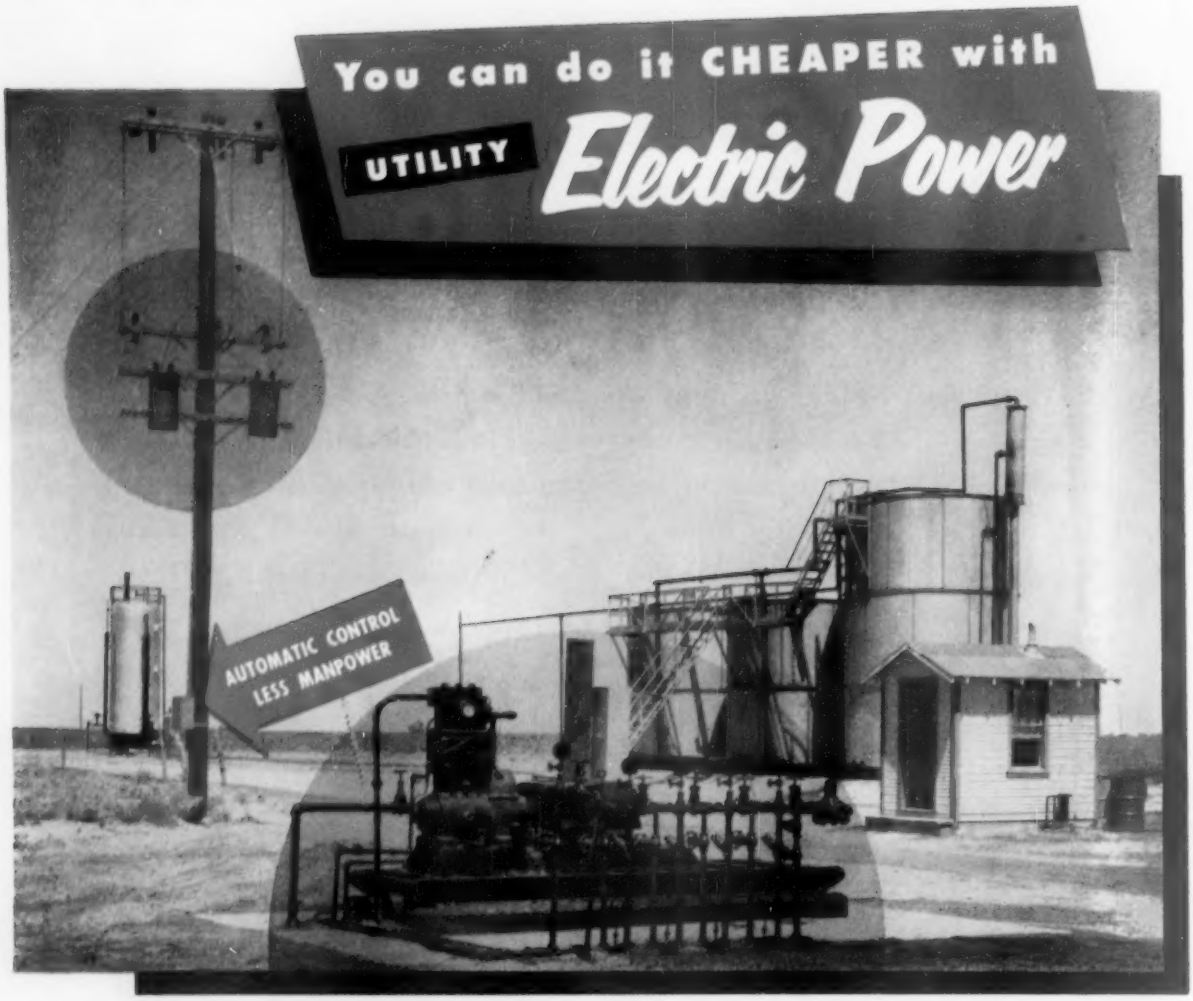


You can do it CHEAPER with UTILITY Electric Power



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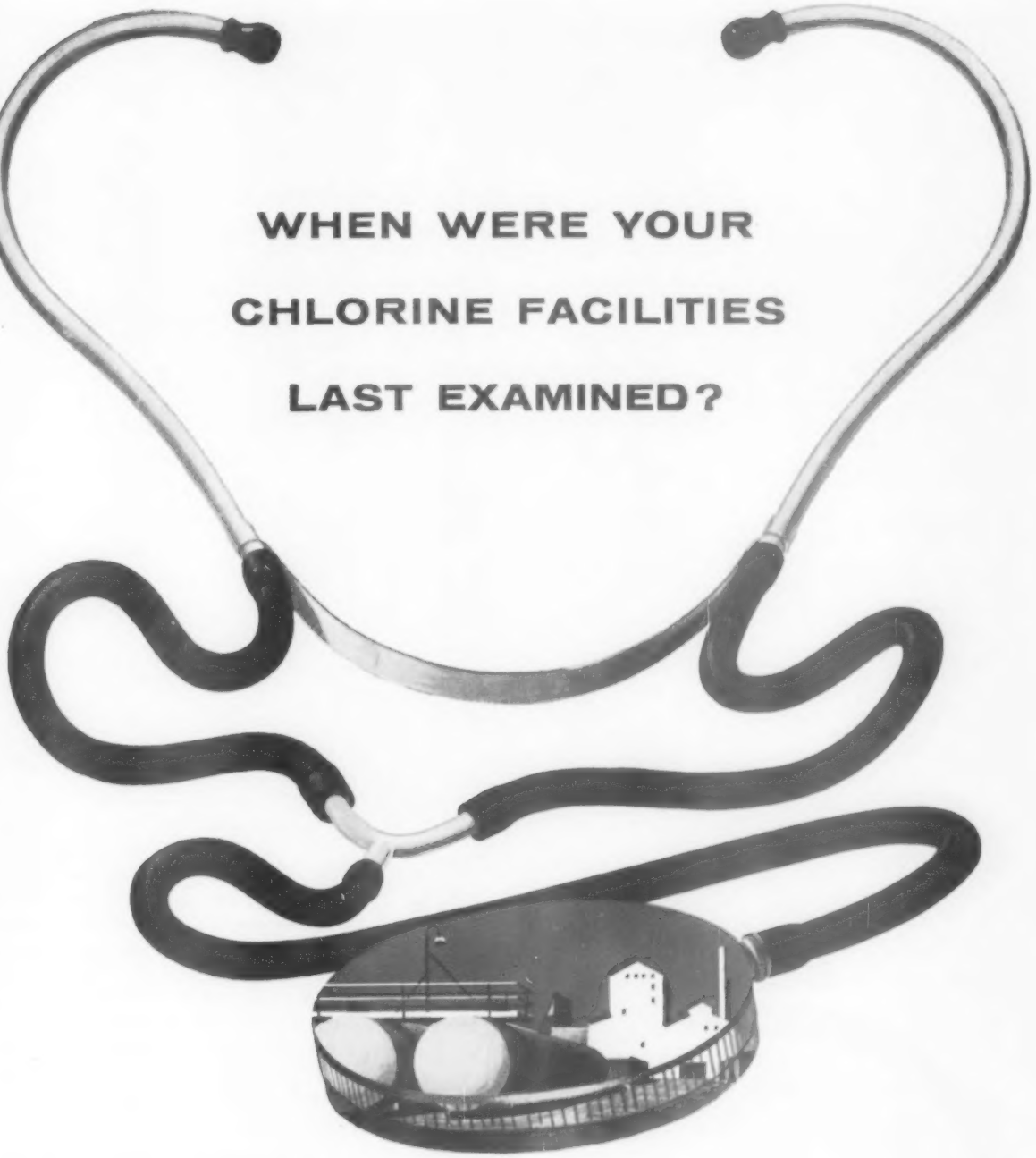

It is a wise policy to have your chlorine equipment and facilities examined every year by a Columbia-Southern engineer.

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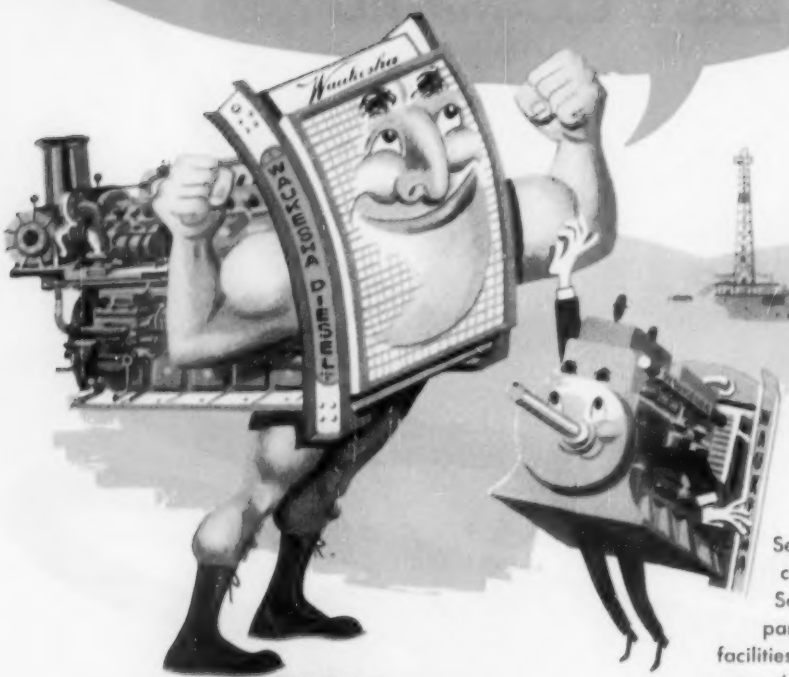

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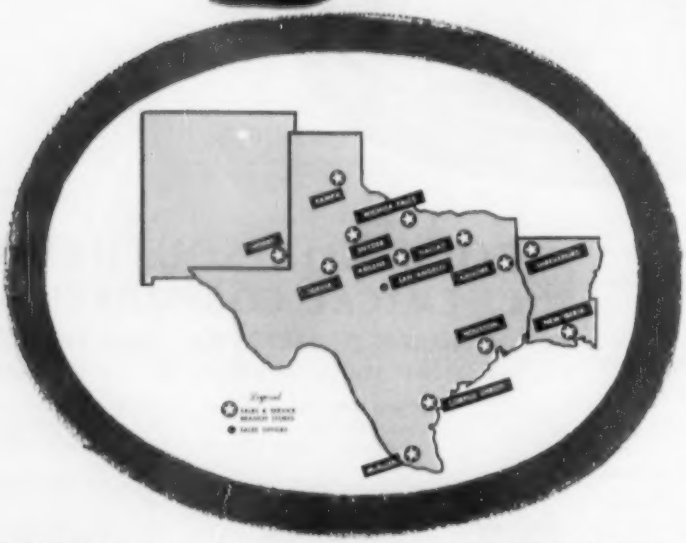

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REDUCED MAINTENANCE • REDUCED STRESS AND WEAR ON ENGINE AND TRUCK PARTS
QUICKER TRIPS ... HOUSANDS OF
TROUBLE-FREE ... ORE PAYLOAD
HIGHER TRADE ... ER OPERATION
GREATER VEHI ... GHER TRADE-IN
MORE PAYLOA ... DUCED STRESS
AND WEAR O ... ER TRUCK LIFE
QUICKER TRIPS ... ERATING COST
EXTRA THOUS ... QUICKER TRIPS
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EATON 2-SPEED AXLES CUT COSTS FOR TRUCK OPERATORS

The experience of thousands of truck operators in practically every industry shows that trucks equipped with Eaton 2-Speeds haul more, quicker, at lower cost per mile; spend more hours on the job, less time in the shop; last longer, and are worth more on the trade-in. Performance records prove that with reduced operating and maintenance costs, Eaton 2-Speeds pay for themselves over and over.

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. . . for speed, power, size, performance! Yes, almost every day you hear of record-breaking equipment built by Avondale for the Oil Industry—the largest pipe jacket of its kind, a derrick barge with the greatest lifting capacity of any in the world. This is because Avondale specializes in meeting the increased demands of offshore drilling—accepting any challenge that will mean better service to one of her best customers, the Oil Industry. And Avondale delivers in record time, too—with production schedules topping the mark for speed and efficiency. No matter what your requirements . . . call Avondale!

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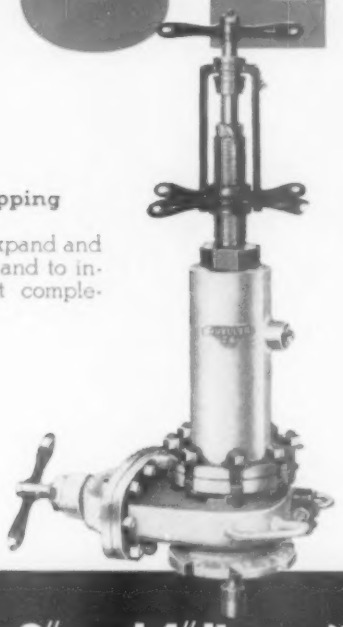


Unit No. 2 Stopping Machine
Used to insert, expand and extract stoppers and to insert and extract completion plugs.

Repair, relocate, replace or modify production lead lines, field gathering lines and feeder lines quickly and easily without halting production. Mueller No. 2 Line Stopper Units effectively isolate any length of line and conveniently by-pass flow around the isolated section. Work is carried on in complete safety without loss of fluid.

work on 3" and 4" lines *without interrupting flow!*

Unit No. 2 Welding Fitting
With 150, 300, 400 or 600 pound flanges for pressures to 1200 p.s.i. at 100°F. Sizes 3" and 4".

Line Stoppers are economical, too. Fittings may be reused at any time or, if line is abandoned, they may be salvaged for reuse on other lines.

Mechanical joint line stopper fittings are also available for use when and where welding is not desired.

Unit No. 2 Mechanical Joint Fitting
For pressures to 175 p.s.i. at 100°F. Sizes 3" and 4" steel pipe and 4" only cast iron.

Other Line Stopper Units available in sizes from ¾" through 12".

NO-BLO

Contact your Mueller Representative or write direct for full details and specifications.

MUELLER CO.
Dependable Since 1857
MAIN OFFICE & FACTORY DECATUR, ILLINOIS

HOW TO BUY ROTARY HOSE

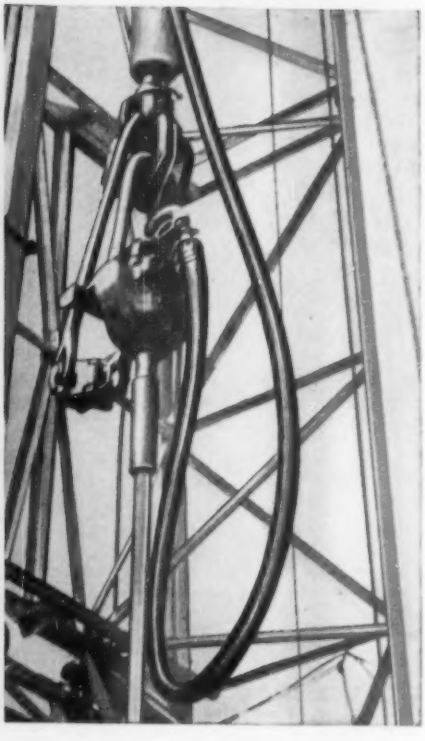
FOR SAFER DRILLING AND LONGER LIFE

"More Use per Dollar"

Insist on a hose construction that is strong, yet flexible and easy to handle . . . a hose coupling designed to add to hose safety and long life.

Rotary hose that is flexible, yet strong, is safer to use because it's easier to handle . . . easier to move from hole to hole and rig-up without accident. Ordinary hose with solid wire strength member reinforcement is stiff and bulky . . . has a tendency to kink at bending points and become weakened by accidental crushing on the job. Flexibility without bulk also makes the hose hold steadier in the rig . . . without whipping under the high pressures of deep drilling operations. Make certain the hose you select has strength members properly engineered and positioned for maximum flexibility and safety. Make certain the hose coupling is designed to contribute to easy handling and freedom from accidents . . . safeguard against costly leaks and dangerous blowouts.

Specify, by name, the rotary hose engineered to give you the highest safety factor, longest life and lowest cost per foot drilled . . . specify "Ray-Man" CBL Rotary Hose.



RAY-MAN CBL ROTARY HOSE

The Ray-Man method of applying high tensile steel cable wires under precisioned tension provides greatly increased strength and flexibility . . . makes Ray-Man CBL Rotary Hose safer to use and handle, easier to transport and rig-up without accident. Strong, flexible cable strength member gives Ray-Man CBL Rotary Hose higher resistance to accidental crushing. Manhattan's streamlined, built-in coupling is designed without protruding lugs or flanges. It features the blow-out proof "Lip-Lok" Seal that tightens under pressure for extra safety. These features plus a special oil-proof tube add up to longer, trouble-free service. Bulletin #6743 describes other features which assure you "More Use per Dollar" with Ray-Man CBL Rotary Hose.

RM 509

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

NOW, MORE THAN EVER BEFORE, THIS TRADEMARK IS

RECOGNIZED AND RESPECTED

WHEREVER ENGINES ARE USED

...ON LAND.....AT SEA.....IN THE AIR...

Ever since 1902, Continental engines have been building acceptance for manufacturers of powered products—first in the automotive industry, and more recently throughout the whole power equipment field . . . The Continental Red Seal trademark was helping to sell motor cars long before the advent of such frills as comfort and style, back in the days when the big question was simply: "Will it run?" The engine with the Red Seal name plate ran, and that took a lot of the guesswork out of the business of choosing a car . . . Today, Continental dependability is a byword all over the world. Continental Motors has not only kept abreast of technological progress, but has constantly broadened its line to meet changing needs. In the Transportation-Agricultural-Industrial Division alone, some 75 basic engine models are available, in more than 2,000 different specifications, for every conceivable job within their broad power range . . . Continental diversification was never so broad as today. Red Seal power is building prestige for manufacturers of vehicles, farm tractors and implements, industrial trucks, conveyors and materials handling devices, pumps, mixers, compressors, earth movers and other road building and maintenance equipment, as well as for leading builders of boats and utility planes. End-users of products in all these specialized fields are learning to choose the machine whose maker thinks enough of his own good name to standardize on Red Seal power . . . To the builders of such machines, as well as to the ultimate users whose preference guides the choice, Continental pledges continuation of the policies which have earned the Red Seal trademark such universal respect. Emphasis on sound engineering, precision manufacture, and all else that goes to make up quality, will be zealously maintained.

SEE YOUR OIL FIELD SUPPLY STORE

RED SEAL ENGINES ARE BACKED BY PARTS AND SERVICE EVERYWHERE

Continental Motors Corporation

MUSKEGON • MICHIGAN

6 EAST 45TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 SOUTH SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA • 910 SOUTH BOSTON STREET, ROOM 1008, TULSA, OKLAHOMA • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GEORGIA

Hydreco Gear Type Pump and Dudco Dual Vane Fluid Motor.

Petroleum Production Moves Forward with Power

FLUID POWER

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. Turbine-type, 150 gpm, 600 ft. heads. Condensate Return Units.

Time schedules for modern exploration, drilling, production and pipe line operation leave no room for equipment that does not best combine Safety, Flexibility, Speed and Economy. Thus, Fluid Power gets the call to provide thrust or rotary motion for drill rigs, rotary tables and winches . . . for drives and controls on portable equipment and vehicles . . . for power to drive pumps, generators, mixers and actuate valves along pipe lines.

The DUDCO and HYDRECO Divisions of The New York Air Brake Company produce components for improved hydraulic circuits for all types of field and production equipment. For 1000/1500 psi operation, the HYDRECO Division furnishes Gear Type Pumps and Motors as well as Control and Auxiliary Valves and Hydraulic Cylinders.

The DUDCO Division provides Dual-Vane Pumps and Motors for 2000 psi circuits and 5000 psi Variable Delivery Pumps for special high pressure applications.

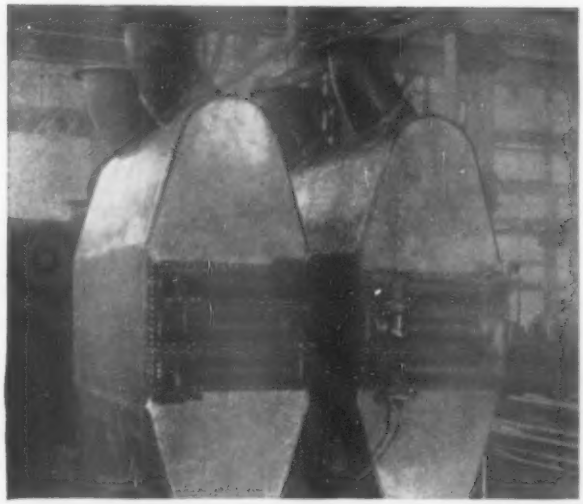
In addition to this advanced type Hydraulic equipment, The New York Air Brake Company contributes a broad range of Liquid Handling Pumps and world-famous Kinney High Vacuum Pumps to Petroleum production. Here, for the oil man to choose, are Aurora Turbine and Centrifugal Pumps and Kinney Heliquad Gear and Rotating Plunger Pumps . . . equipment to solve the problems of "pumping any substance that will flow through a pipe." And, for de-aerating, dehydration, vacuum distillation, refrigeration and other petro-chemical processes . . . Kinney Vacuum Pumps.

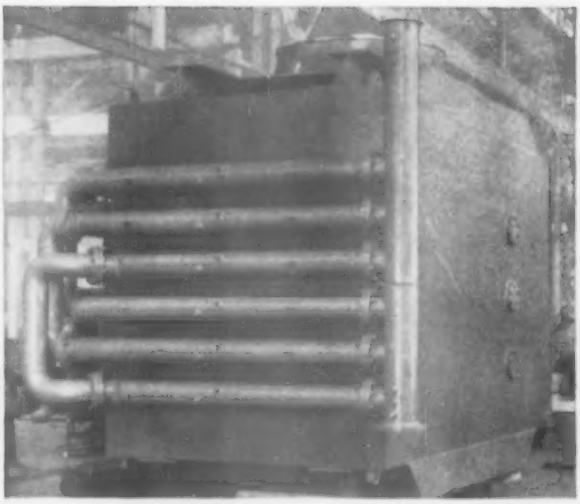
Bring your file of information up to date on new developments in hydraulic, liquid handling and vacuum equipment. Write for catalogs today!

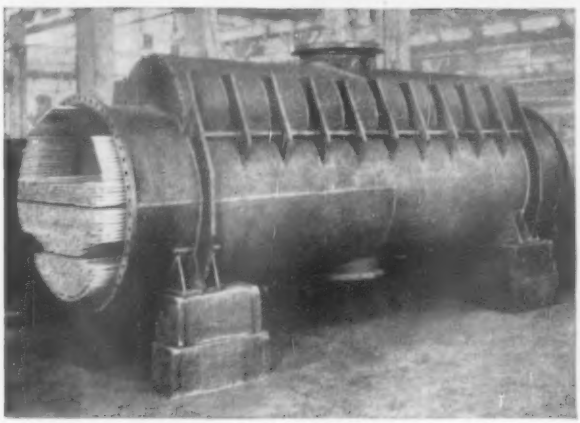
THE NEW YORK AIR BRAKE COMPANY

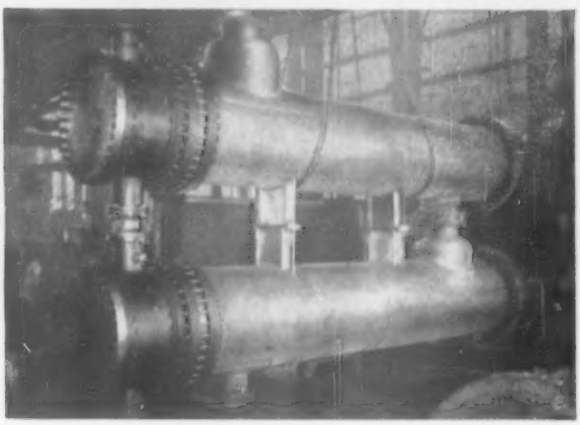
230 PARK AVENUE • NEW YORK 17, N. Y.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.









Even the most specialized exchangers and condensers

get a head start here!

On the assembly floors of the Kewanee-Ross plants in Buffalo, N. Y. and Kewanee, Ill., are Ross Exchangers and Surface Condensers of numerous designs.

Some are completely standardized . . . some partly standardized . . . others completely special.

But *all* have a big point in common: *They were off to a head start from the time Ross engineers were first consulted.*

Unsurpassed experience with a tremendous variety of both standard and special designs is usually able to produce successful precedents for most requirements. Often, for even the most specialized needs, standard components in a wide range of working pressures can be utilized at tremendous savings in cost and time . . . flanges, shell and floating head covers, tube sheets, tube layouts, shells, channels, for example. And from the all-important standpoint of fabricating facilities, the two, large, modern plants of Kewanee-Ross are equipped with the latest machines and tools to do the job better and faster.

Before you form your own opinion on how complex or specialized your condenser or exchanger has to be to meet your requirements, consult with a Kewanee-Ross engineering representative. A short talk can well result in many shortcuts to a satisfactory solution.

KEWANEE-ROSS CORPORATION

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

1417 WEST AVENUE • BUFFALO 13, N. Y.

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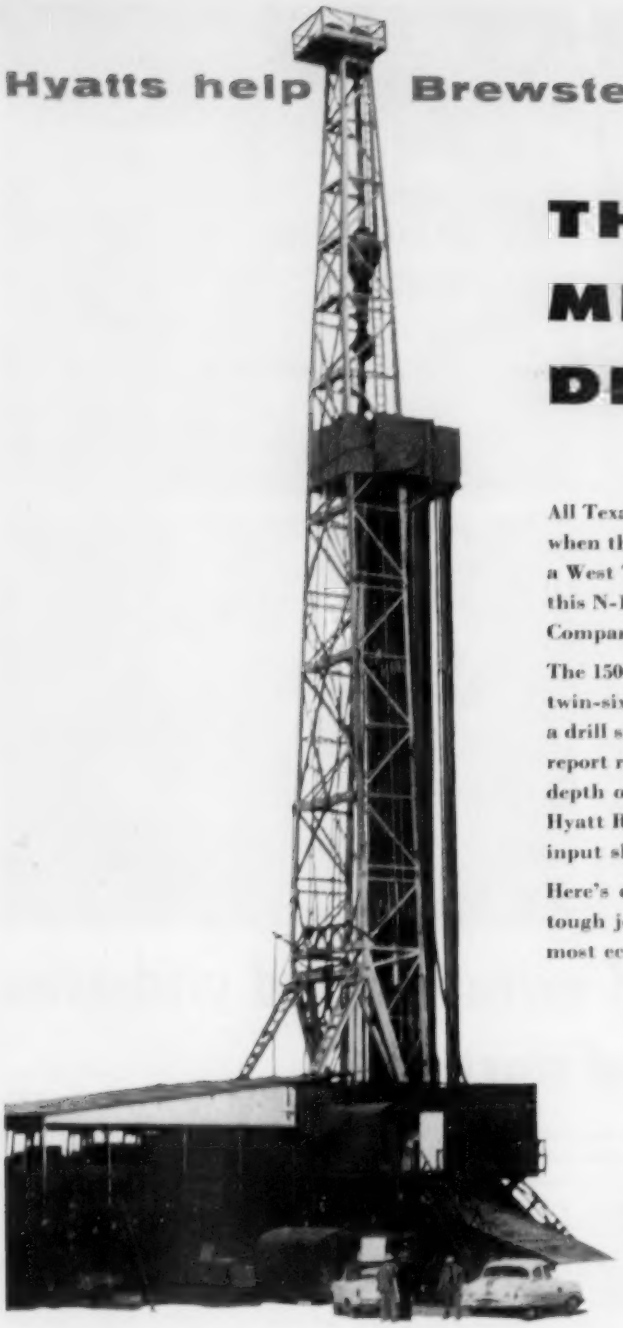
ROSS

Serving home and industry: AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Hyatts help Brewster rig drill well over

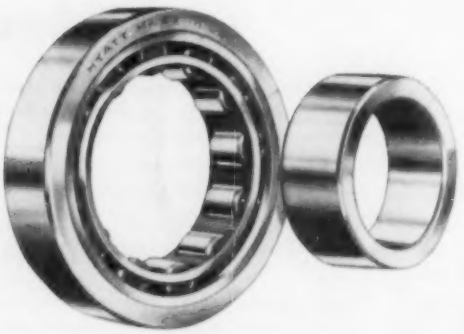
THREE MILES DEEP!



All Texas drilling depth records were broken recently when the Penrod Drilling Company, of Shreveport, pushed a West Texas Wildcat past the 18,661-foot mark, using this N-12 "golden rig" built by the Brewster Company, Inc., of Shreveport.

The 1500-hp rig is powered by four General Motors twin-six diesels, permitting round trips in nine hours with a drill string that weighs *175 tons*. Tool pushers report remarkably little downtime despite the tremendous depth of the well—a tribute to the stamina of the Hyatt Roller Bearings on the four engine shafts, drawworks input shaft and other vital load-carrying shafts.

Here's dramatic proof again that on the really tough jobs, the *best* bearings you can buy are the most economical HYATTS!



HYATT ROLLER BEARINGS

STRAIGHT ◯ BARREL ◯ TAPER ◯

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

Green Triangle Rotary Hose

TAKES MORE

GIVES MORE

This superior product of New York Belting & Packing Company has proved performance under the most demanding conditions . . . proved to take greater pressure and give greater strength and flexibility.
There's a Green Triangle Rotary Hose for every possible drilling pressure:

3-BAND

Exceeds API specifications **for maximum pressure.**

2-BAND

API Class C — 5,000 lbs. **for normal average drilling pressure.**

1-BAND

API Class A — 3,000 lbs. **for medium or low pressure.**

NEW YORK BELTING & PACKING CO. • Founded 1846

CONTINENTAL

Serving the Oil and Gas Industries

THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

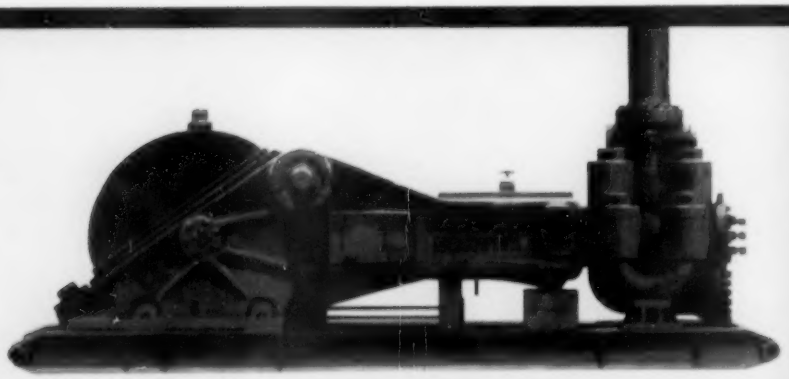
THERE IS A

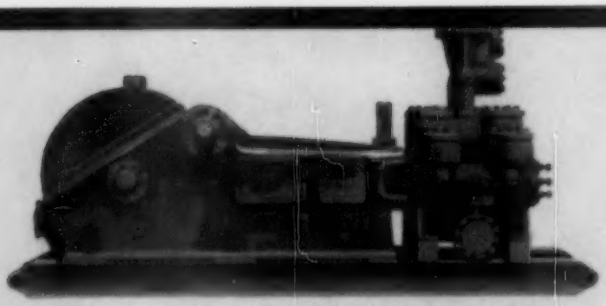
GARDNER-DENVER MUD PUMP

FOR EVERY REQUIREMENT

FROM 20 FT. TO 20,000

. . . Let your Continental Mud Pump Specialist help you select the right one.





CONTINENTAL

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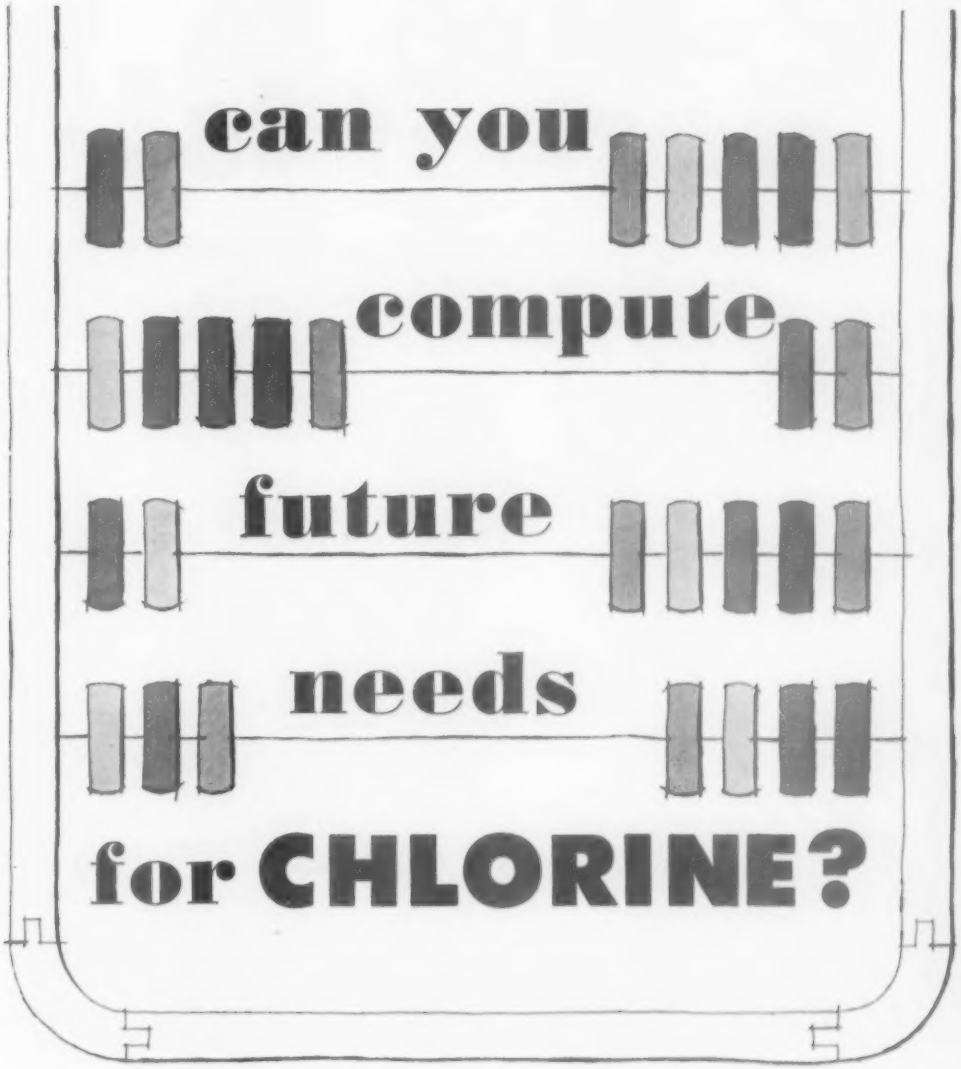
Representatives in All Principal Oil Fields of the World



If you're buying chemicals today, chances are you'll be buying even greater tonnages five years from now. Will other companies also have larger needs? Will there be new users?

Coordinated planning and production with Olin Mathieson assures the availability of chemical raw materials regardless of changing market conditions; assures adequate chemical production to supply growing industrial capacity; speeds the development of new chemical products and processes; provides greater flexibility in shipping and handling of materials; provides the personal attention of recognized product experts backed by widely diversified research facilities.

Today, more than ever, an association with an alert, aggressive chemical producer is essential to your future. Olin Mathieson's long experience and familiarity with the broad market picture will prove invaluable in your planning. Why not consult with us *now?*

3301- CL

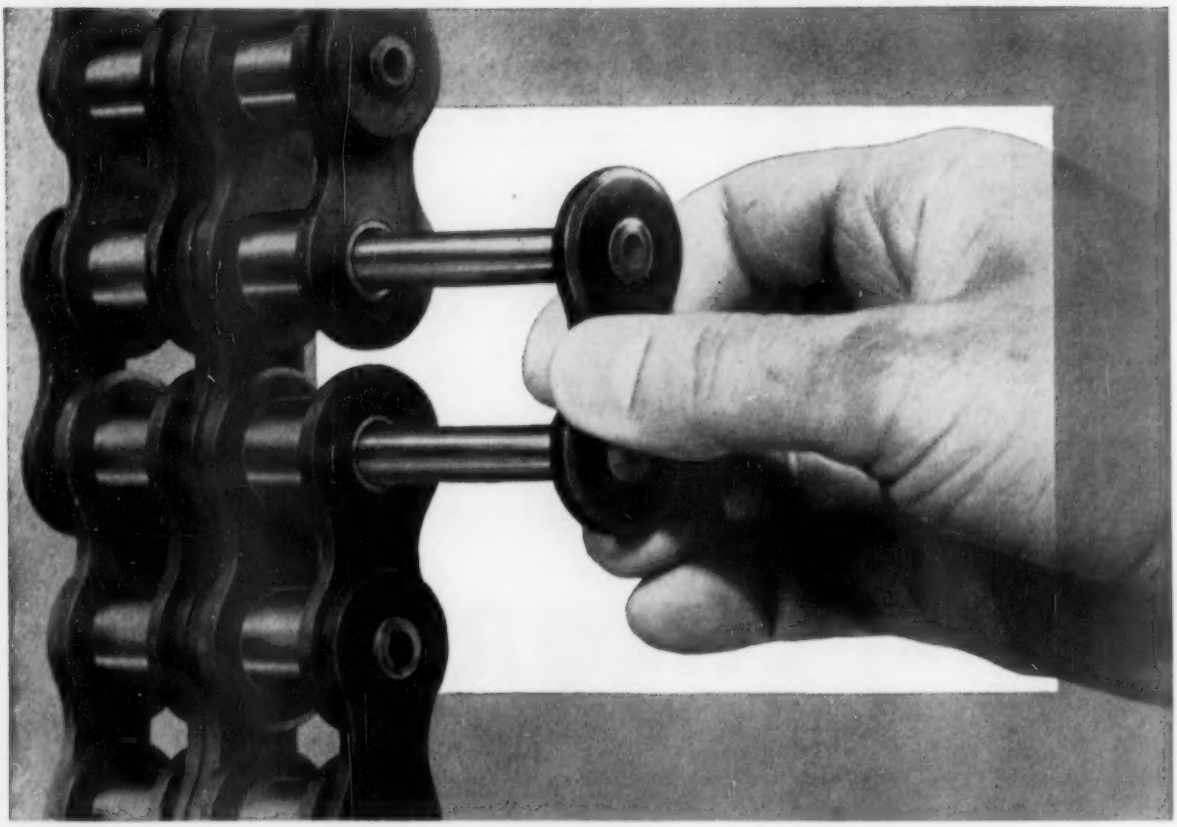
MATHIESON

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION · BALTIMORE 3, MD.

INORGANIC CHEMICALS: Ammonia · Bicarbonate of Soda · Carbon Dioxide · Caustic Soda · Chlorine · Hydrazine and Derivatives · Soda Ash · Hypochlorite Products · Nitrate of Soda · Nitric Acid · Sodium Chlorite Products · Sulphate of Alumina · Sulphur (Processed) · Sulphuric Acid

ORGANIC CHEMICALS: Ethylene Oxide · Ethylene Glycols · Polyethylene Glycols · Glycol Ether Solvents · Ethylene Dichloride · Dichloroethylether · Formaldehyde · Methanol · Sodium Methylate · Hexamine · Ethylene Diamine · Polyamines · Ethanolamines · Trichlorophenol · Trichlorobenzene

Here it is!



A ROLLER CHAIN

that meets all your needs!

Rex Oil Field Roller Chain is exactly what you've asked for...easy to take apart... easy to assemble...longer service life.

No more smashed fingers...lost drilling time...extra expense...tempers lost...trying to take a chain off the rig. Rex Oil Field Roller Chains are amazingly easy to take apart...and just as easy to couple together.

End premature breakdowns due to chain failures! Rex Oil Field Roller Chains give top service under toughest drilling conditions. The far longer service life you get with these extra-rugged chains will keep your drilling costs down...you'll drill more feet of hole per day and per year.

Contact your supply store or write your closest CHAIN Belt Company Oil Field Office. Oil Field Offices: Dallas, Houston, Midland, Los Angeles, New York, Tulsa. Oil Field Warehouses: Dallas, Houston, Los Angeles. CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT COMPANY

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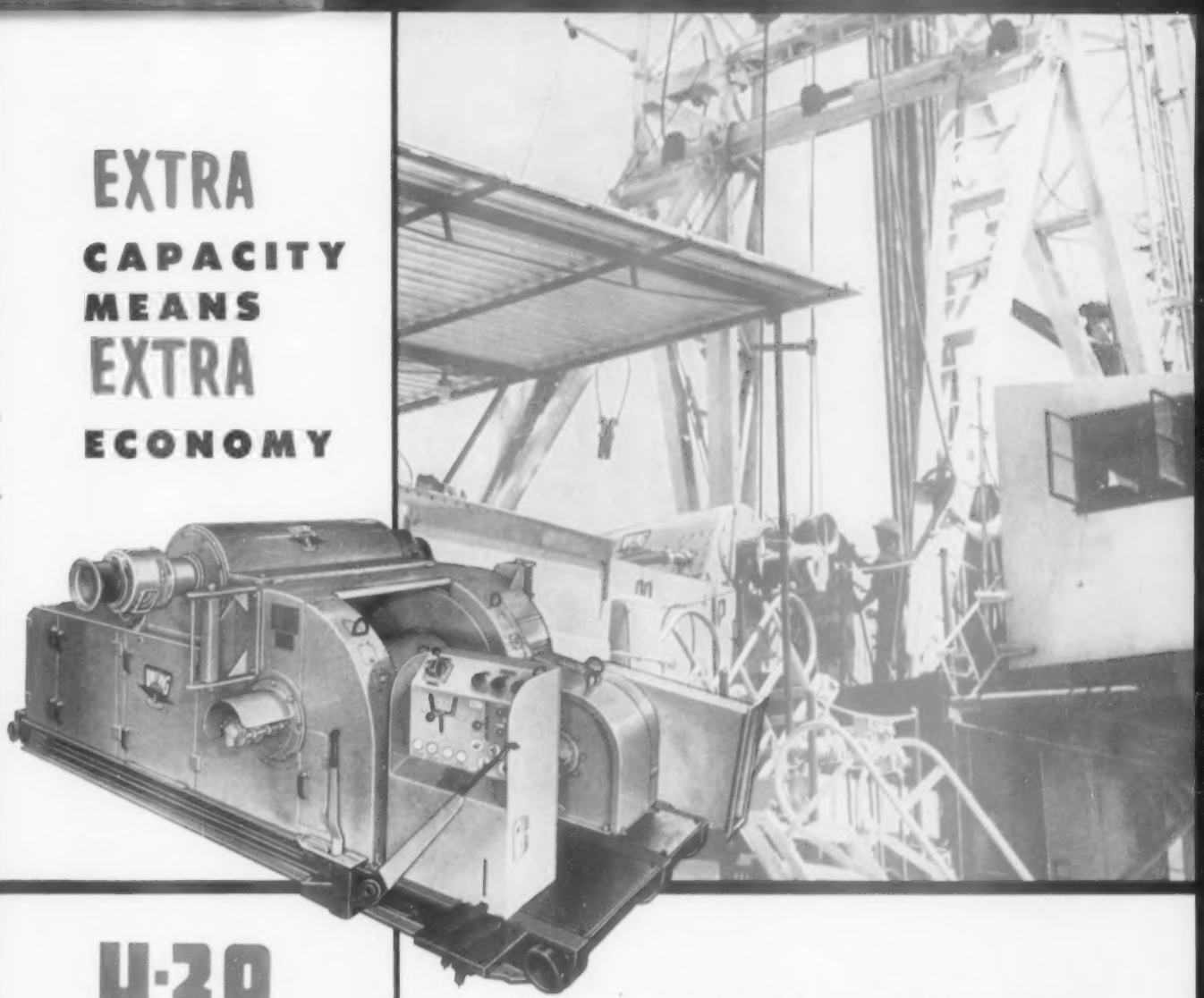
EXTRA CAPACITY MEANS EXTRA ECONOMY



U-20

800 TO 1200 INPUT HORSEPOWER.

MECHANICAL, HYDRAULIC COUPLING OR TORQUE CONVERTER DRIVE.

SIX FORWARD AND TWO REVERSE SPEEDS TO DRUM AND ROTARY.

EXTRA LARGE DRUM, 26½" DIA. x 50" LONG BARREL.

The U-20 is rated conservatively. It has proved satisfactory drilling less than 8,000 feet and more than 12,000 feet with 4½" drill pipe. The reserve power, and smooth operating control so necessary when the bit reaches maximum depth, also, furnishes the extra speed and ease of operation necessary for economical drilling in the shallower depth range. The same careful engineering that makes the U-20 operate efficiently and economically at deeper levels, helps cut the costs when drilling to less than 10,000 feet.

Get the facts about the economical operating U-20 at your supply store, or write to the factory for catalog.

UNIT

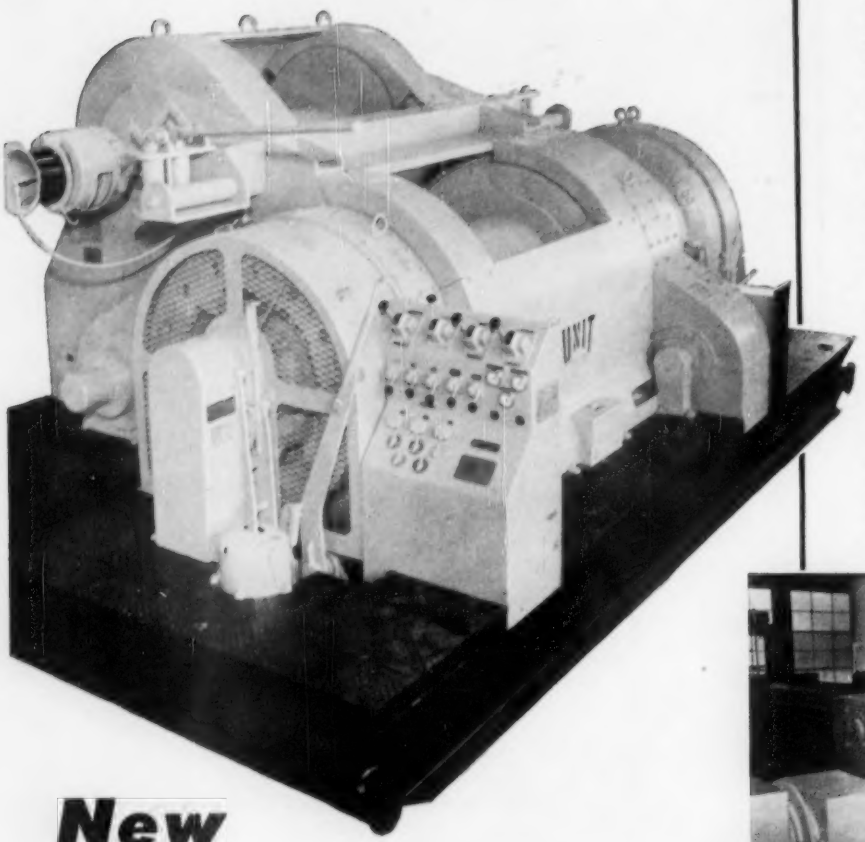
. . . . at Unit Rig SERVICE comes first

UNIT RIG & EQUIPMENT CO.

TULSA, OKLAHOMA, U. S. A.

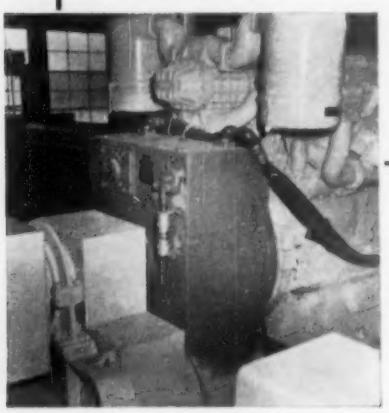
UNIT RIG PRODUCTS ARE SOLD THROUGH LEADING SUPPLY COMPANIES THROUGHOUT THE U.S.A. AND CANADA

EXPORT SALES — MID-CONTINENT SUPPLY COMPANY 45 Rockefeller Plaza, New York 20, New York Cable — MIDUNITRIG



7 BASIC BENEFITS

- HUD reduces impact shocks up to 70%, on both driving and driven equipment.
- Permits full use of peak engine torque over an extended operating range.
- Disconnect feature eliminates need for engine compound clutches.
- Extends range of available speeds and pressures on mud pumps.
- Prevents engine stalling or lugging under load . . . extends engine life as well as lives of chains, clutches, sprockets and other running parts.
- Allows rig to be eased into load without strain or shock . . . heavy loads are pulled even in sticky formations without lugging the engine.
- Permits more rapid acceleration of both engines and load.



New UNIT U-1220

uses 3 Twin Disc HUD Fluid Couplings . . .

for faster drilling, less downtime!

Pictured above is the new Unit U-1220, which is owned and operated by Loffland Bros. Drilling Co., who will use it on an offshore drilling platform. One of the largest in existence, this rig is designed for offshore and deep well drilling—with special attention given to corrosion problems encountered in this type operation.

The U-1220 is powered by 3 Caterpillar D-397 engines with 3 Twin Disc 27" Model HUD Disconnecting Fluid Power Take-Offs—and is driven by a Mid-Continent 3AE swinging drive.

The HUD Fluid Couplings provide increased drilling rate and speed ranges — more effective work from compound — unmatched ease of control over rotary, drawworks and pumps. They allow drum clutch to be engaged with brakes set, while engines can be gradually accelerated with release of drum brakes. When fishing, the precise control of speeds and loads provide improved performance.

Equip *your* rigs—present and future—with Twin Disc HUD Disconnecting Fluid Power Take-Offs, and make hole faster, easier — *at less cost per foot.*

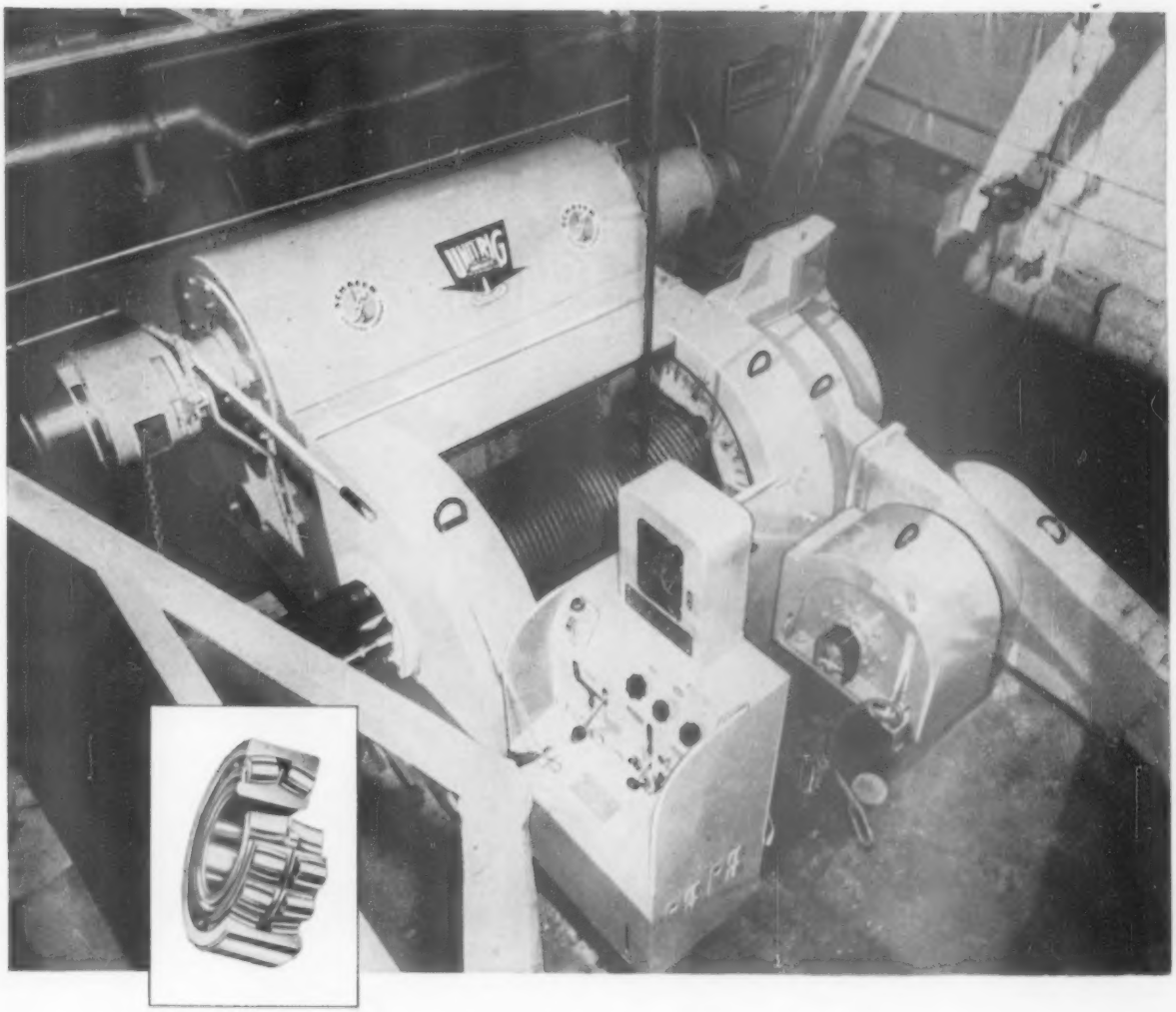
For complete information, write today for Bulletin 506, from Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois.

Model HUD (inset above) is available in sizes 21" and 27" to handle 100 to 850 hp engines. Operates with either cooling radiator or heat exchanger. Incorporates shortened oil sump to fit rig design.

TWIN DISC

TWIN DISC

Fluid Couplings



21 SKF Spherical Roller Bearings Are 21 Good Reasons for...

UNIT RIG'S PEAK CAPACITY AND MOBILITY

The Unit Rig & Equipment Company, Tulsa, Okla., wanted its new Model U-40 Draw Works to be exceptionally portable. They also wanted the capacity to handle hook load and speeds of from 694,000 lbs. at 25 ft./min. to 26,000 lbs. at 476 ft./min. To help accomplish both these laudable purposes, Unit Rig specified SKF Spherical Roller Bearings for 21 locations on drum shaft, input shaft, countershaft, jackshaft, rotary countershaft, and cat shaft.

The greater capacity, size for size, of SKF Spherical Roller Bearings helped Unit Rig to build maximum capacity into a rig of compact and portable design. The design of the SKF Spherical Roller Bearing makes it inherently self-aligning. The bearing's full capacity is always available for useful work. The design and proportion are such that in addition to heavy radial load the SKF Spherical Roller Bearing supports heavy thrust load in either direction.

Better bearings are the reason that wherever you find men drilling for oil, you're likely to find SKF bearings – doing a dependable job. 7641

SKF Spherical Roller Bearings in the Model U-40
drum shaft 4 • jack shaft 3
countershaft 4 • rotary countershaft 3
input shaft 4 • cat shaft 3

SKF®
BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.,
manufacturers of SKF *and* HESS-BRIGHT® *bearings.*

UNIT RIG
-&- EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

NEW MUD-PROOF ROTARY

Dynamically Balanced Table

The Unit Rig Rotary Machine is the most up-to-date rotary on the market . . . with new design features which make it easy to install and trouble-free to operate. Dynamic balancing electronically during the factory run-in relieves vibration stresses, reduces bearing and gear wear, and assures quieter, longer, smoother operation.

Three models available. For specifications write to Machinery Dept., Mid-Continent Supply Co., P. O. Box 189, Fort Worth, Texas.

1. Triple labyrinth seal stops foreign material from entering table
2. Flinger rings and mud shields deflect mud from working parts
3. Labyrinth seal checks mud from entering from below
4. Flush table top throws mud away from moving parts.

AUTHORIZED DISTRIBUTORS

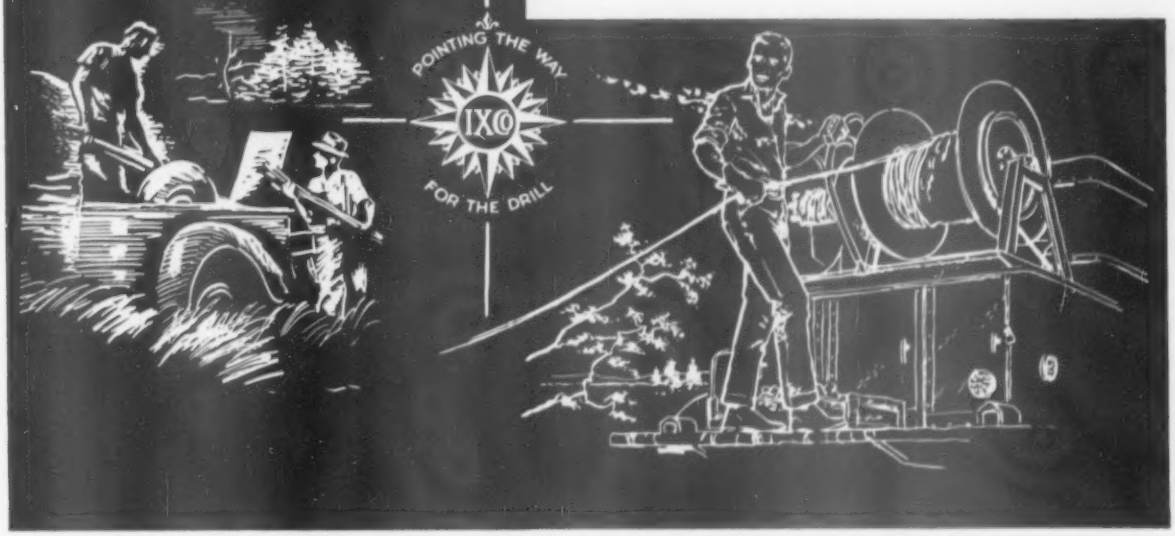
MID-CONTINENT Supply Company

MID-CONTINENT BLDG. FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

S. A. White, Supervisor, is another one of the executives on the IX roster with more than 20 years of geophysical survey experience. Starting with the company in 1933 after attending Texas Christian University, White has worked in every job on a field crew, including helper, shooter, scout, troop leader, and party chief. Men like White are "in charge" on every IX survey.

DERRICKS TODAY
Where I. X. Parties Were Yesterday



IX crews need no constant reminders on the importance of their field work. These crews have seen too many discovery wells brought in . . . entire new fields opened as the result of their geophysical surveys. They know that prior planning and attention to detail will help give an IX client a better "picture" of an area. Consequently, the "know-how" each crew has gained in years of field work pays off in a better survey for you. For a survey you can trust, call on experience — call IX.

Independent
EXPLORATION COMPANY
Geophysical Surveys

1973 West Gray, Houston, Texas

39 Victoria St., London, SW 1, England

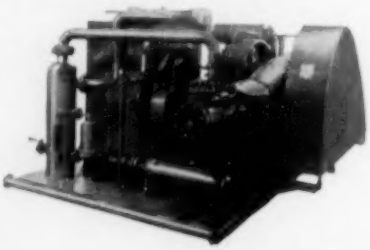
208 Dominion Bank Bldg., 8th Ave. & 1st St. East, Calgary, Alberta, Canada

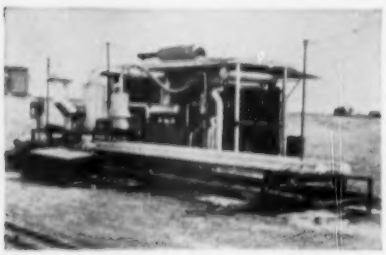
I-R EQUIPMENT DESIGNED FOR

air drilling

GYRO-FLO COMPRESSORS. This pair of 600 cfm Gyro-Flo rotary compressors, mounted on a single skid base, provides a compact and flexible source of power for air drilling at 125 psi pressure. These simple, rugged, rotary units are available in sizes from 125 to 600 cfm, driven by diesel, gasoline or natural gas engines.

TYPE ES COMPRESSORS. This compact, skid-mounted unit, packaged by Wilson Supply, is used to supplement the Gyro-Flo rig shown above, boosting pressure to 500 psi for air drilling through wet strata. Compressor is an Ingersoll-Rand Type ES unit, complete with gas engine drive and cooler.





GAS-ENGINE COMPRESSORS. Here, a 220-hp JVG gas-engine compressor provides ample pressure and capacity for aerated-mud drilling. Skid-mounted unit packaged by J. B. Beaird Co. includes cooling radiator, manifolding and I-R starting air compressor. Intercooler, after-cooler and automatic control and recording equipment shown in foreground. Similar units available in sizes to 600 hp.

3 Types of I-R Compressors offer air-drilling "power packages" for wide range of requirements

The use of compressed air, pressurized gas and aerated mud to remove cuttings has, in many cases, resulted in substantial gains in drilling speed and bit life.

Successful air drilling, of course, requires a compact, thoroughly dependable source of air power capable of delivering the proper volume and pressure for the particular operation. These requirements vary widely, according to depth of hole, type of ground, and whether or not water is encountered.

Whatever the conditions of air, gas or aerated mud drilling, there's an Ingersoll-Rand compressor that's *right* for the job. The three typical "power packages" shown here have been designed specifically for this type of work.

For complete details on equipment best suited to *your* particular needs, contact your nearest I-R representative. His experience can get you off to a good start in this promising new field.

Ingersoll-Rand

14-283 ♥ 11 BROADWAY, NEW YORK 6, N. Y.

COMPRESSORS • PUMPS • AIR AND ELECTRICAL TOOLS • VACUUM EQUIPMENT • ROCK DRILLS • CONDENSERS • GAS AND DIESEL ENGINES

Mack six-wheeler recently added to fleet of Jess Edwards, Corpus Christi, Texas.

they get the calls for the toughest hauls!

Ask someone like Jess Edwards—a ten-state oilfield contractor—why he keeps on using Macks. You can bet it's because he's sold on their performance and economy.

He'd have good reason for saying so, too. Mr. Edwards has had Macks working for years under extremes of weather and road conditions in his 125-unit fleet operation. He knows from experience that there's nothing like a Mack for ruggedness, dependability and long life.

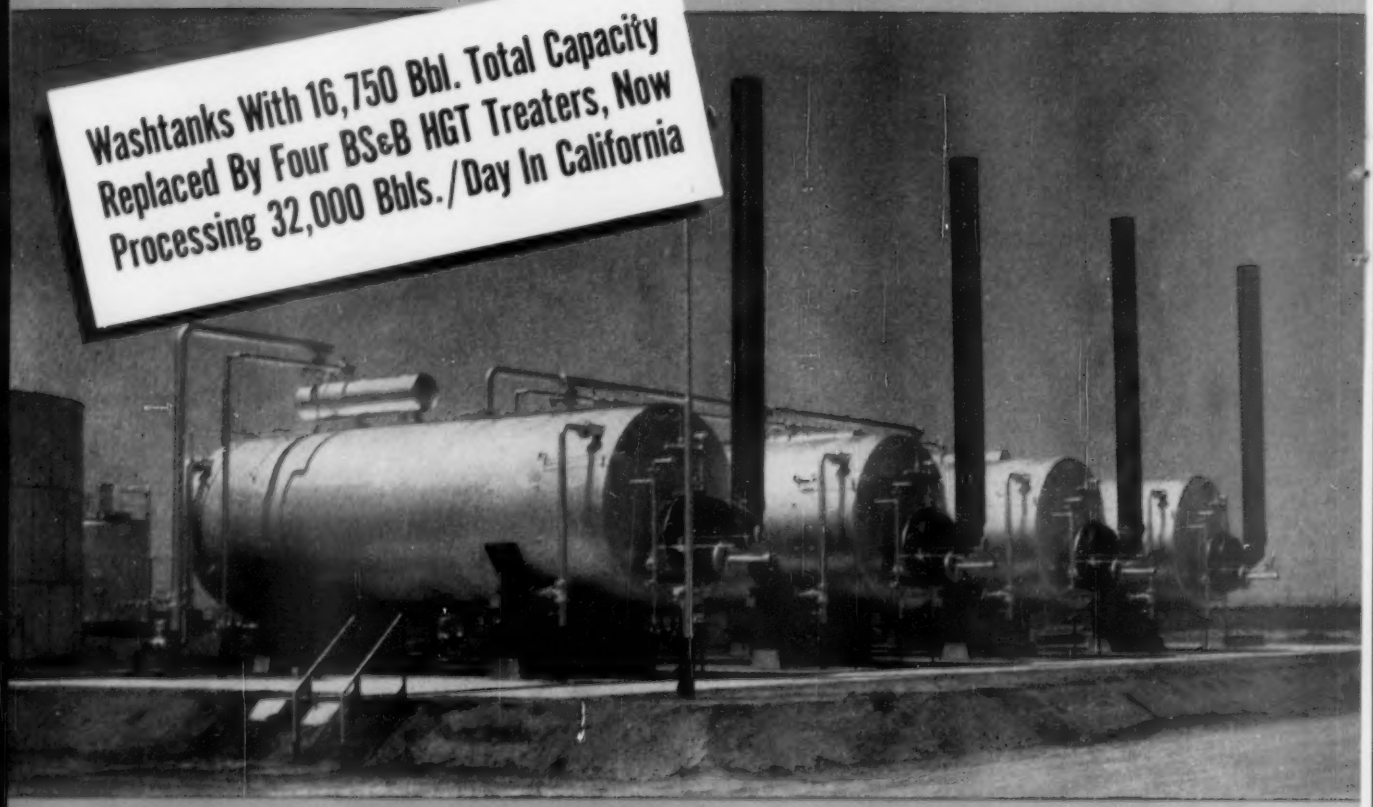
Take the Mack Balanced Bogie and Power Divider, for example. This exclusive combination gets a Mack six-wheeler through even the toughest spots. It's one of many reasons why Macks get the job done—and fast.

Why not put a Mack on *your* hardest hauls? Keep a strict check on its every job . . . count the time and money you save every day. Then see if you don't agree —it pays to invest in Macks.

MACK TRUCKS Empire State Building, New York 1, N. Y.

3131

New BS&B Horizontal Emulsion Treaters Effect Substantial Fuel Cost Savings!



These four new BS&B Horizontal Emulsion Treaters are presently removing 4000 bbls. of water per day from a total wellstream production of 32,000 bbls. of 35 API emulsified oil per day. They are operating with a 10° F. reduction in treating temperature, a 30% saving in chemical costs, and a substantial reduction in fuel gas used. These treaters are in service in the Bakersfield, California, area for one of the major oil companies, and replace one 3000 bbl., seven 1500 bbl., one 1000 bbl. and three 750 bbl. washtanks.

EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

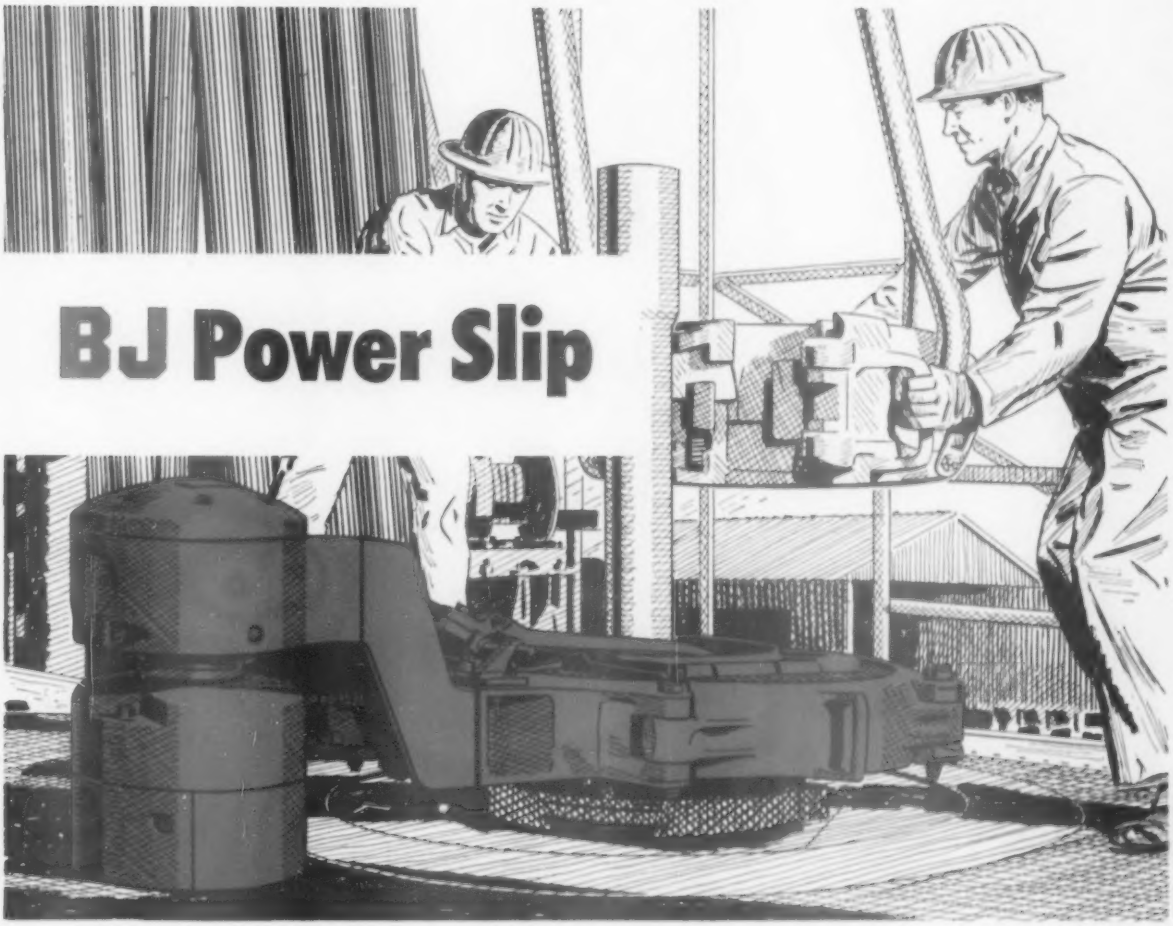
Here's the New BS&B Model HGT Horizontal Treater that is attracting so much widespread attention throughout the oil industry! Compare the features of this unit with those of any other units with which you may be familiar:

- √ Single Chamber Design
- √ Float Controlled Oil-Water Interface
- √ Larger Gas Separating Capacity
- √ Greater Oil Settling Time
- √ Maintains Higher Gravity Crudes by Lower Treating Temperatures
- √ Closed System Steam Chest Requires No Make-Up Water
- √ Steam Chest Built to ASME Code Requirements
- √ Steam Heating Allows Maximum Safety With Minimum Service
- √ Requires Only ½ as Much Hook-Up Time as Vertical Treaters
- √ Available in a Size to Meet Your Requirements
- √ Two Access Manways for Easier Servicing
- √ Skid-Mounted If Desired

If you'd like more information, contact your nearest BS&B Representative, or write directly to . . .

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A98
1708 West Main Street Oklahoma City, Oklahoma



BJ Power Slip

Two *new* safety features protect pipe and equipment

More power, more speed *and now more safety*—these are the exclusive advantages that make it even more profitable to handle pipe or casing with the improved BJ Power Slip.

NEW SLIP SETTING DEVICE prevents damage to equipment or loss of a string of pipe by automatically lowering and setting slips when the elevator touches the setting trigger. This guards against damage to the slip arm ring.

NEW SAFETY SIGNAL alerts the driller if he attempts to raise the slips before the elevator has picked up the string. While a load is on the slips, any movement of the "UP" control pedal sounds a warning whistle. Both the SLIP SETTING DEVICE and SAFETY SIGNAL are optional on new BJ Power Slips and can be quickly added to all BJ Type "B" Slips now in service.

Check now all the time-saving, cost-cutting advantages of the BJ Power Slip. With new safety features... fast action side opening... automatic pressure centering... ample working space... and unitized construction that allows permanent installation with the rotary table... it pays to put BJ Power to work for you!

For full information on more profitable pipe handling, call your nearby BJ field Sales Engineer. Or write today to:

Greater Versatility... with Less Cost
The BJ Casing Bowl, with extra-long slips and special carrier, economically adds to the versatility of the BJ Power Slip by extending load capacity to 300 tons and casing ranges to 13⅝".

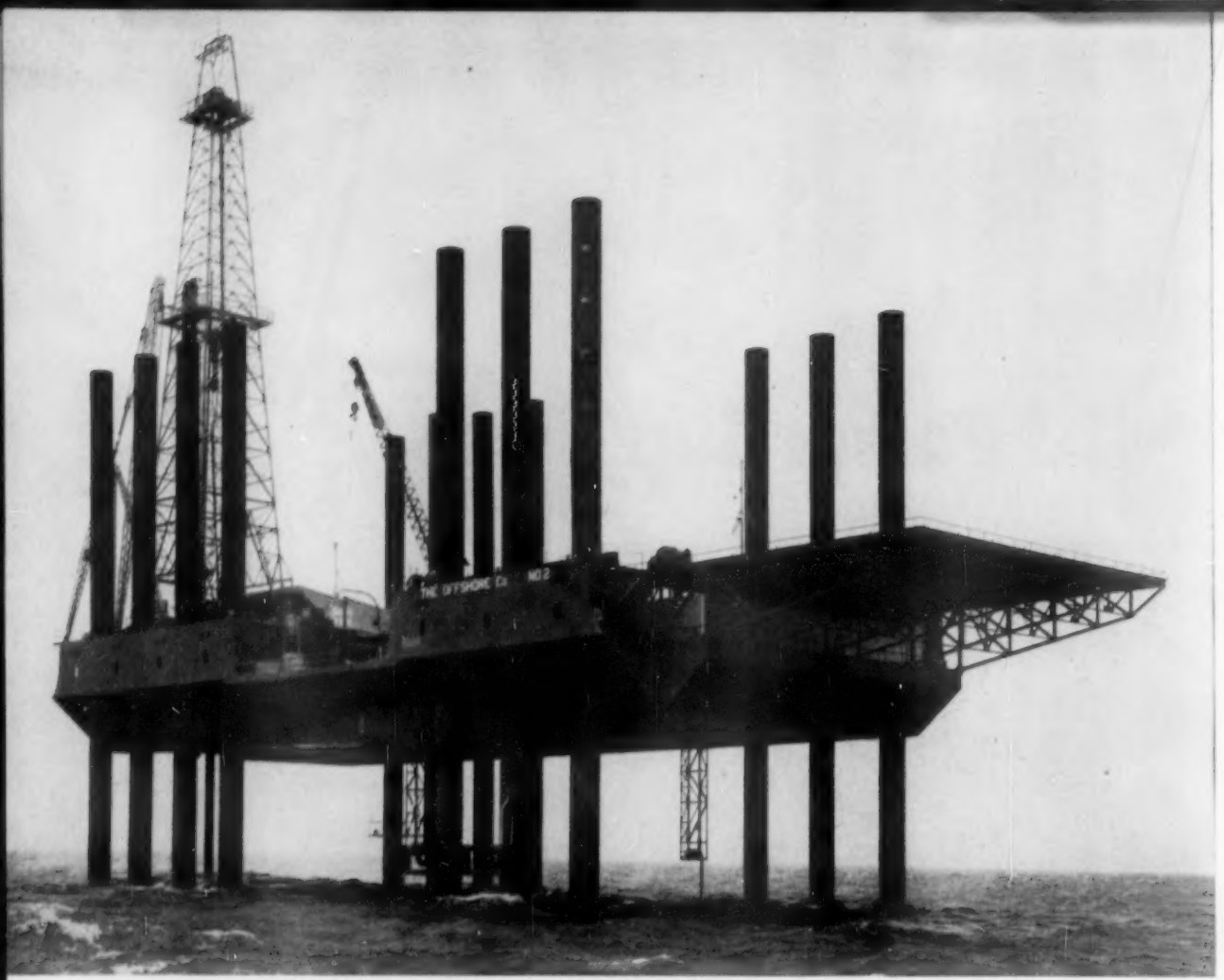
BJ

Byron Jackson Co.

Oil Tool Division *Since 1872*

P. O. Box 2017, Terminal Annex, Los Angeles 54, California

Offices in Houston, Fort Worth, Denver and New York and Sales Engineers in all principal oil fields



Biggest on the Gulf is Offshore Company's multi-million dollar mobile platform capable of drilling in water depths of 100 feet to explore for the rich oil and gas reserves of the Miocene Trend miles below the ocean floor.

The Big Wildcatters Are Choosy

Where they're playing for million-dollar stakes, oilmen count on Pittsburgh Steel Company's seamless oil country goods to help lower the odds.

Offshore Company's $3.8 million mobile platform No. 2 is the largest entry in the sweepstakes for the rich oil and gas reserves below the ocean floor in the Gulf.

This ocean-going monster weighs as much as a tanker and has deck dimensions slightly smaller than a football field. It carries a 146-foot high drilling rig on its back, is generously equipped for fast drilling, and has first-class crew quarters.

When it moves into position, its fourteen sea legs are lowered and air-jack driven into the ocean floor. Each is a 6-foot diameter steel caisson, 200 feet long and weighing 100 tons. Then the barge climbs up the caissons until it is at a safe operating level above water, and begins drilling.

Once on location its towering framework can be battered by hurricane winds and lashed by waves. Yet it won't budge. Its powerful drilling equipment is built to stab through miles of earth beneath the ocean to reach pay quickly.

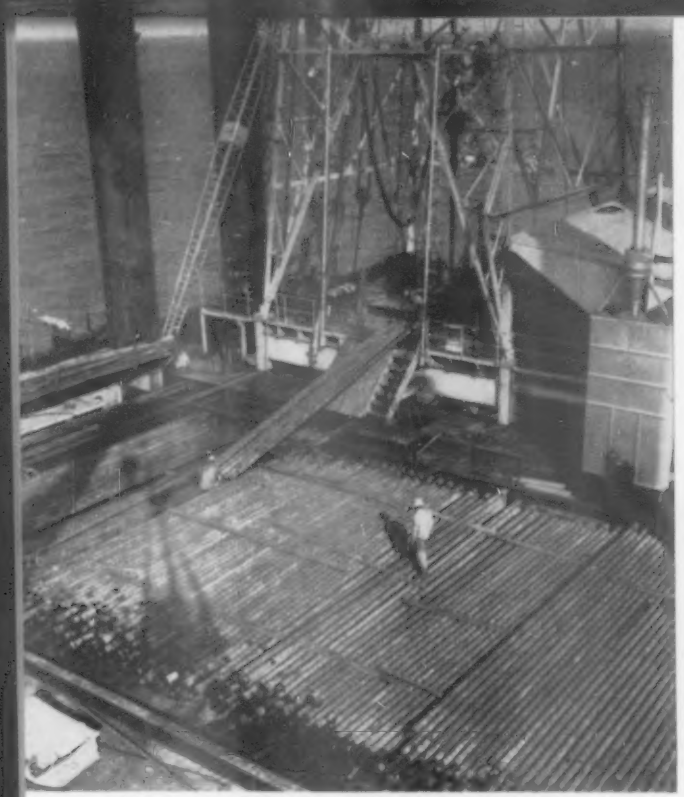
When you consider the large investment and heavy costs involved, you can understand why oilmen who operate equipment such as this can't afford to take chances on equipment or service.

The pay-off comes on the footage of hole drilled. All time and expense that does not deepen the hole, lowers profits. Equipment failures or service delays pile up losses rapidly.

The fact that this rig is equipped with Pittsburgh Steel Company's seamless drill pipe is a credit to the quality of the product. To oilmen who have relied on Pittsburgh seamless for more than a half-century, its selection is not surprising.

Offshore No. 2 is using 5-inch OD Grade E Range 2 drill pipe. It has a minimum yield strength of 75,000 psi, and needs every pound of it.

Rotating at 120 rpm and drilling an average of 500 feet of hole a day, as it was on the operation shown



Seamless drill pipe from Pittsburgh Steel Company, racked on the barge deck, is fed length by length into the hole as it deepens in the race to reach pay.

High above the ocean a derrick man stabs a stand (three 30-foot lengths) of drill pipe into the hole. This pipe goes in at better than a stand a minute.

here, the drill pipe at the top of the hole may be under a tension of well over 100 tons. It is subject to continuous fatigue and torsion. Abrasive and corrosive wear also are always present.

Pittsburgh seamless, along with other equipment for Offshore No. 2 was supplied through one of the independent distributors listed at right. The selection of an independent to provide the fast and flexible service needed for a rig such as this was natural.

As the barge reached its finishing stages prior to launching, the independent's field representative stood by on 24-hour alert. The mobile telephone in his car was busy with calls to his warehouse for instant delivery of required parts.

Now he calls regularly at the dock from which the rig is serviced, continuing his 24-hour, 7-day a week vigil to cut any costly delay that might occur. He provides the same experienced, personal service—free from red tape, cluttering paperwork, and remote control—that is the specialty of all independents on the list.

The next time you need a string of drill pipe, casing, or tubing, why not get the pipe of your choice through the supplier of your choice? Specify Pittsburgh seamless!

Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Norvell Wilder Supply Company
P. O. Box 4145
Beaumont, Texas

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Seamless Oil Country Goods . . . *a product of*

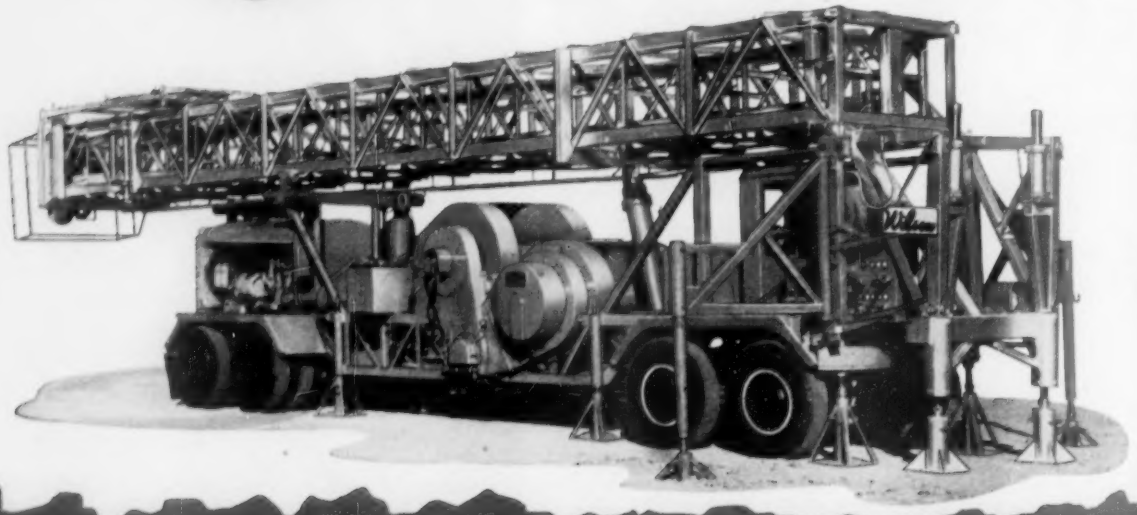
Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland • Columbus • Dallas Dayton • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh San Francisco • Tulsa • Warren, Ohio. PLANTS: Monessen, Pa. • Allenport, Pa. Akron • Los Angeles • Unionville, Conn. • Warren, Ohio • Worcester, Mass.

THE Wilson WINCHMOBILE

MOGUL "42" TORCAIR MODEL



RATED CAPACITY 16,000 Feet 2½" Tubing | **OVERALL DIMENSIONS** Length: 54 feet Width: 96 inches Height: 13 ft. 6 in. | **WEIGHT** Front Axles 26,250 lbs. Rear Axles 41,520 lbs. Total 67,700 lbs.

FEATURES

- Drums mounted directly on vehicle frame, which eliminates the winch frame, saving several thousand pounds of weight.
- Mogul "42" double drum Torcair winch.
- Line capacity, upper drum, 16,200 ft. 9/16".
- Line capacity, lower drum, 5,500 ft. 7/8".
- Full air controls on winch located where desired.
- Aluminum pressure plates on Air-Tube clutches.
- Fabricated angle steel frame of "Man-Ten" steel.
- Mogul 96' fabricated angle steel mast, 260,000 lbs. capacity.
- Optional 90', 96' and 102' masts.
- Mast hydraulically raised, telescoped and with kickover jacks.
- No ground guy lines needed for most ordinary loads.
- Outrigger for mast wind bracing.
- General Motors 12107 *Twin* six diesel engine, with Allison torque converter.
- Engines optional, GM 110, Waukesha WAKBU and others.
- Allison TG-617 Torqmatic transmission with air controls.
- Parkersburg 15" double Hydrotarder with Air-Tube clutch.
- Eaton 82-F dual front axles with 11:00-20 tires.
- Both sets of front wheels steer, no dragging tires.
- Air power steering.
- Can be built in Mogul "42" or Super "38" size winch.
- Front Tandem axle suspension system of Wilson design using Hendrickson beams, is the simplest, lightest, and strongest system yet designed.

BE MODERN - BUY WILSON

Wilson

WILSON MANUFACTURING CO., INC.

WICHITA FALLS, TEXAS, U.S.A.

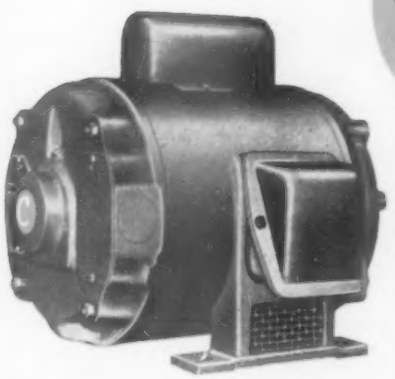
The Home of RED IRON

Your choice of normal or low starting current...

with Performance-Rated

Century

SINGLE-PHASE, HIGH TORQUE MOTORS FOR OIL FIELD USE



Capacitor Motors... ⅛ to 20 H.P. provide high starting torque, high pull-up torque and require normal starting current. They are available in drip proof, dust proof and explosion proof enclosures.

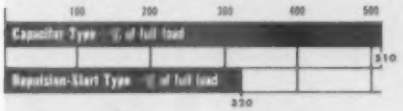
Even if you have severe starting current limitations, you can select the torque you need for sure starts and smooth pull-up to speed from the Century Performance-Rated Single-Phase line (see bar chart below for operating characteristics of two types of Century Single-Phase Motors).

Whatever Your Oil Field Motor Job... there's a Century Motor Performance-Rated to handle it with top effectiveness. For added outdoor protection, Century *Weather-Gard* Motors have openings screened to keep out rodents. Check with your supply store, or Century branch office.

TYPICAL OPERATING CHARACTERISTICS

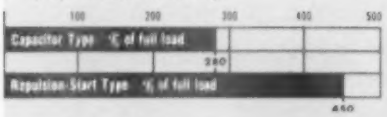
STARTING CURRENT

(Important on Heavily Loaded Circuits)



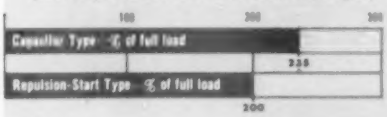
STARTING TORQUE

(Torque Available at Break-Away)



PULL-UP TORQUE

(Least Torque Available Between Start and Full Load Speed)



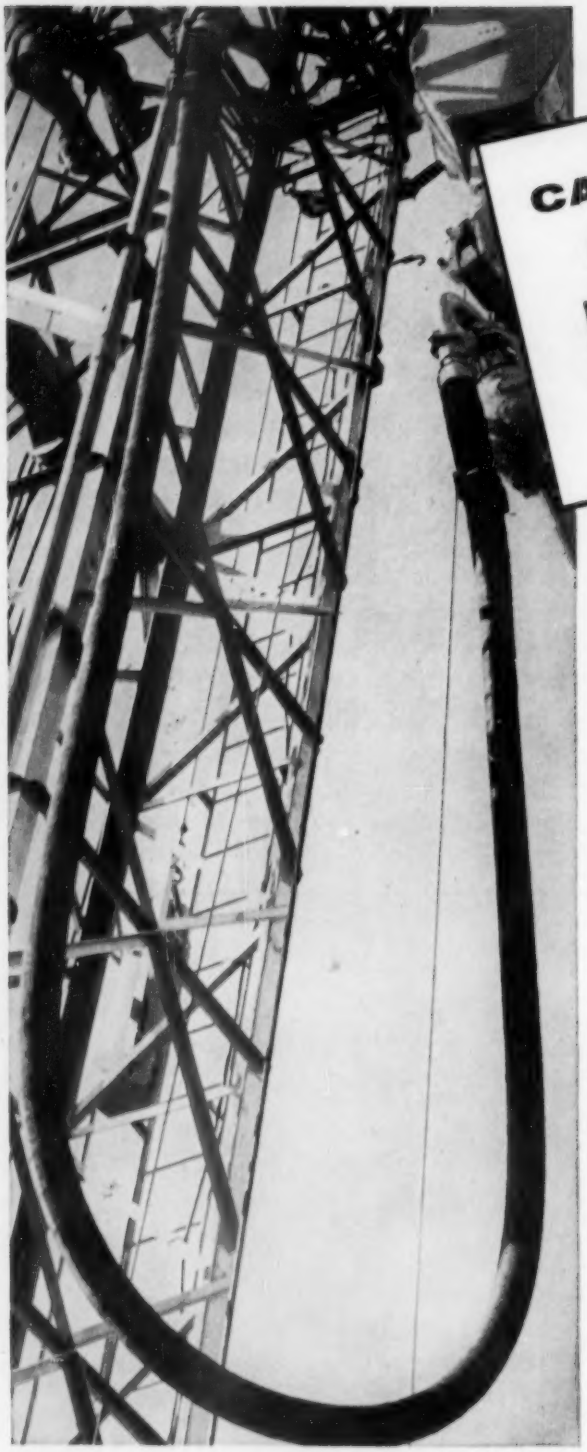
Repulsion Start, Induction Motors (type RS)... ½ to 7½ H.P. provide very high starting torque, yet require unusually low starting current. They are available in drip proof and splash proof enclosures.

Performance-Rated® Motors ⅛ to 400 H.P.

CENTURY ELECTRIC COMPANY

CE-32

1806 Pine Street, St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*



CABLE-REINFORCED ROTARY HOSE IS Lighter—More Flexible —Easier to Handle

APPLICATION: Hewitt-Robins Rotary Drilling Hose cuts operating costs by combining the strength of steel with the long life of rubber flexibility. Although lighter, it is tough and strong to take the continuous impact of highly abrasive drilling muds under extreme pressure and flexible enough to meet the stress of constant bending.

CONSTRUCTION: Hewitt-Robins hose is manufactured to take care of every drilling service—from moderate to the highest pressures encountered.

TUBE is a neoprene-base compound well able to meet all current operating conditions.

PRIMARY CARCASS has multiple plies of premium quality, high tensile fabric, frictioned with the finest quality rubber.

SECONDARY CARCASS is reinforced with high tensile, airplane cable wire embedded in thick cushions of rubber.

COVER is a neoprene-base synthetic compound that staunchly resists oil, sun-checking, cutting, abrasion and extremes of temperature (it also has a longitudinal yellow stripe for ease of alignment).

COUPLINGS are the famous Hewitt-Robins Stratoline type.

OTHER HEWITT-ROBINS DRILLING RIG HOSES

HEWITT-ROBINS BLOWOUT PREVENTER HOSE: For use with all pressure operated blowout preventer units—wire braid reinforced.

HEWITT-ROBINS SLIM HOLE ROTARY HOSE: For portable shallow well drilling rigs and core drill service—wire braided and rayon fabric reinforced.

You can save with our Complete Coupling Resetting and Salvage Service for Hewitt-Robins Cable-Reinforced Rotary Hose at our Houston, Texas warehouse.

Hewitt-Robins

Conveyor Belting—Conveyor Machinery—Industrial Hose—Vibrating Screens—Vibrating Conveyors—Design, Manufacture, Engineering and Erection of Complete Bulk Materials Handling Systems.

HEWITT-ROBINS INCORPORATED • STAMFORD, CONNECTICUT

Palco® Seal

A FIBROUS REDWOOD PRODUCT

for
PREVENTING
LOSS of CIRCULATION
in DRILLING
OPERATIONS

NOW AVAILABLE in loosely packed BAGS

- Easy to handle
- Mixes readily with mud
- Disperses thoroughly
- Remains in suspension
- Easily pumped
- Forms dense cross-hatch matting for effective seal
- Resistant to rot or decay
- Now packed in 40-lb. bags or 80-lb. bales

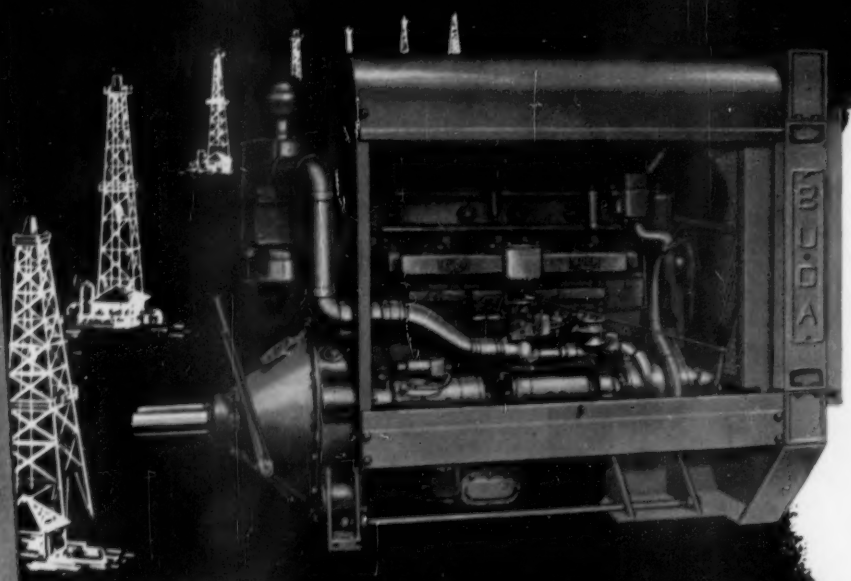
DEVELOPED THROUGH
PALCO® RESEARCH

* TRADE MARK ®

WRITE FOR BULLETIN No. 4-02 describing the properties, operating advantages, and composition of Palco Seal.*

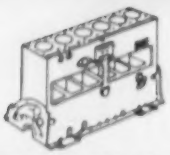
Available through oil field and mud service organizations.

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, California



Here's why BUDA OILFIELD ENGINES keep operating longer...at lower cost

BUDA Oilfield Engines are big, rugged engines — built to deliver maximum performance under the toughest operating conditions. Every component in Buda Diesel, Natural gas and butane engines is designed for longer life . . . greater efficiency or stamina to insure you of more horsepower hours with less maintenance at lower all around cost.



ONE-PIECE CAST BLOCK

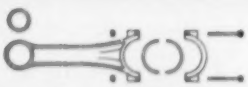
Greater strength and rigidity of Buda Monolithic block design insures longer engine, crankshaft and bearing life . . . less maintenance.

EXTRA STRONG, FORGED and TOCCO HARDENED CRANKSHAFT

Larger diameter Buda crankshaft, with thick, wide cheeks has the strength to withstand heavy loads, sudden shock. Smoother running is assured by precision dynamic balancing.

BIG PISTON DISPLACEMENT

Extra displacement means greater reserve power — lighter engine loading — less strain on the engine — more power in the normal operating range.



GREATER ROD BEARING AREA

Rod bearings are stronger . . . have more load carrying ability . . . longer service life. Connecting rods rifle drilled for pressure lubrication to wrist pins.

5 RING PISTONS

Increased contact area gives better compression seal, better oil control, longer ring and sleeve life — lower maintenance costs.

OVERSIZE PISTON PINS

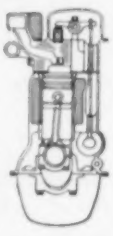
Larger overall bearing area gives greater strength and load carrying ability — longer life, less downtime and maintenance.

SUBMERGED TYPE, FULL PRESSURE GEAR DRIVEN OIL PUMP

Buda lubrication system is positive displacement type — full pressure oil flow through drilled internal passages insures proper lubrication of all parts of the engine.

HIGH VOLUME WATER PUMP, MAXIMUM FLOW COOLING SYSTEM

Large capacity, force feed water pump . . . full length water jackets, greater cooling area, full flow thermostat and by-pass system provide pinpoint temperature control, longer engine life.



See your nearby Buda Division Distributor for complete details on why Buda Oilfield Engines are your best buy in power. Write for Bulletin and specifications.

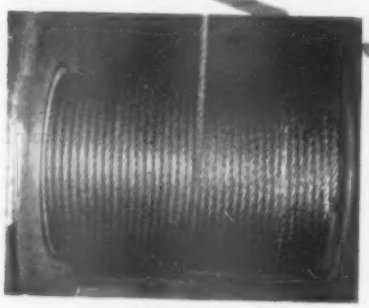
BUDA DIVISION • Harvey, Illinois

80-30

ALLIS-CHALMERS

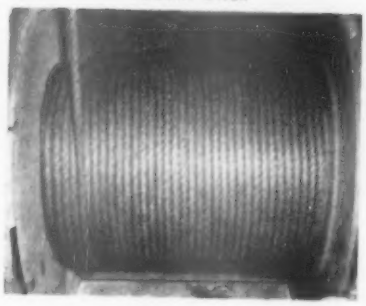
LEBUS
Grooving &
Counterbalance
Control
Pyramid
Spooling System*...

THE ANSWER TO WIRE LINE SPOOLING PROBLEMS



SECOND LAYER

FOURTH LAYER



Spooling on plain drums, or incorrectly grooved drums in the past, caused wire line to cut in, scrub, squeeze and pinch. This definitely kept the line from spooling evenly and made it difficult to spool fast or feed off slow. The new "Three-Point" LeBus GROOVING & COUNTERBALANCE CONTROL PYRAMID SPOOLING SYSTEM has made it possible to overcome these problems and to absolutely control the action of the wire line more than ever before. The photos at left are evidence of how evenly the line builds spools and builds up on the drum.

A smoother running line is definitely due to this new "Three-Point" system engineered by LeBus. The "Three-Point" improvement over previous types of spooling is as follows: (1). *COUNTERBALANCED* to eliminate vibration in the drum; (2). *LESS CROSSOVER ANGLE* to reduce scrubbing, pinching and cutting-in of wire line; (3). *LESS WIRE LINE WHIP* due to the effects of points 1 and 2 on the spooling of the line. One of the biggest problems overcome by installing LeBus Grooving is economy in handling Wireline . . . because A SMOOTH RUNNING LINE IS AN ECONOMICAL LINE.

FOR MORE INFORMATION WRITE

*Patented and Other Patents Pending

LeBus International Engineers, Ltd.

Executive Offices: 305 Wichita National Bank Building, WICHITA FALLS, TEXAS
Sales, Service Control and Warehouse Stock: LONGVIEW, TEXAS

AIR AT WORK

New two-stage Ro-Flo compressor provides constant efficiency... cuts maintenance

Efficiency and air supply are constant year after year with *Ro-Flo* compressors. Even if wear occurs, it is automatically compensated for, so that air supply is unaffected.

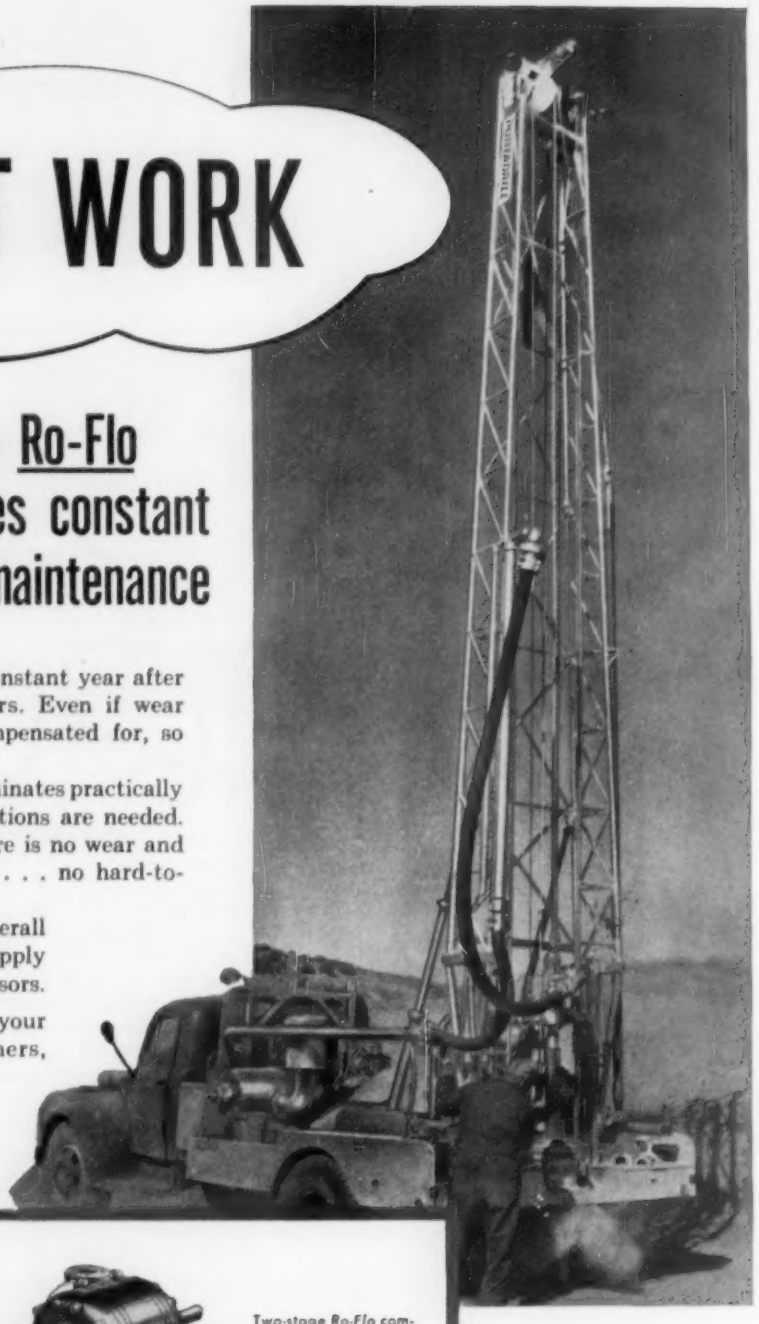
In addition, rotary design eliminates practically all vibration. No heavy foundations are needed.

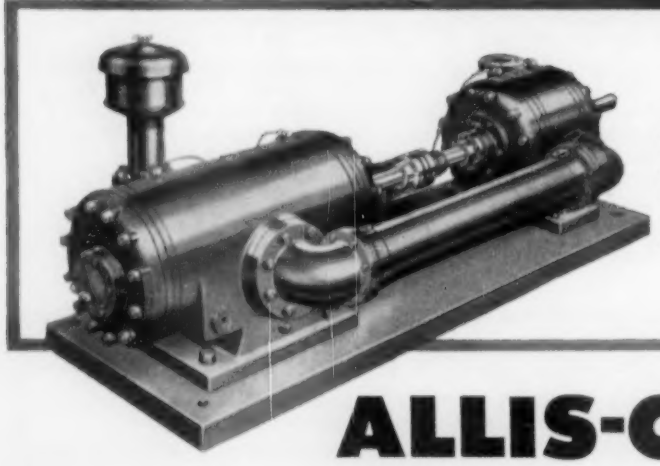
Maintenance is cut too! There is no wear and tear from shock and vibration . . . no hard-to-maintain pistons and valves.

For constant efficiency . . . overall savings on air, modernize air supply with two-stage *Ro-Flo* compressors.

GET THE FACTS: Contact your A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.





Two-stage *Ro-Flo* compressors in pressures from 60 to 125 pounds gauge, and volumes from 250 to 1800 cubic feet per minute. Single-stage units for lower pressures.

A-C ALLIS CHALMERS

A-4738

ALLIS-CHALMERS

PROTECTION for the wheels that make the world go 'round!

For everything that runs, there is a correct Flying Red Horse Lubricant!

THOUSANDS of years ago some obscure genius invented the wheel. With it he made possible most of today's mechanical marvels—and at the same time created a need—*Lubrication!*

This need has become so vital over the centuries that today transportation and industry could not function without lubricants and lubrication knowledge. The Socony Mobil Oil Company is a leader in this specialized field.

For over 89 years Socony Mobil has met the lubrication requirements of pioneers in many fields. Aviation's Wright Brothers . . . early car makers . . . the inventor of the Diesel engine are only a few who have called on the Flying Red Horse for specialized lubricants.

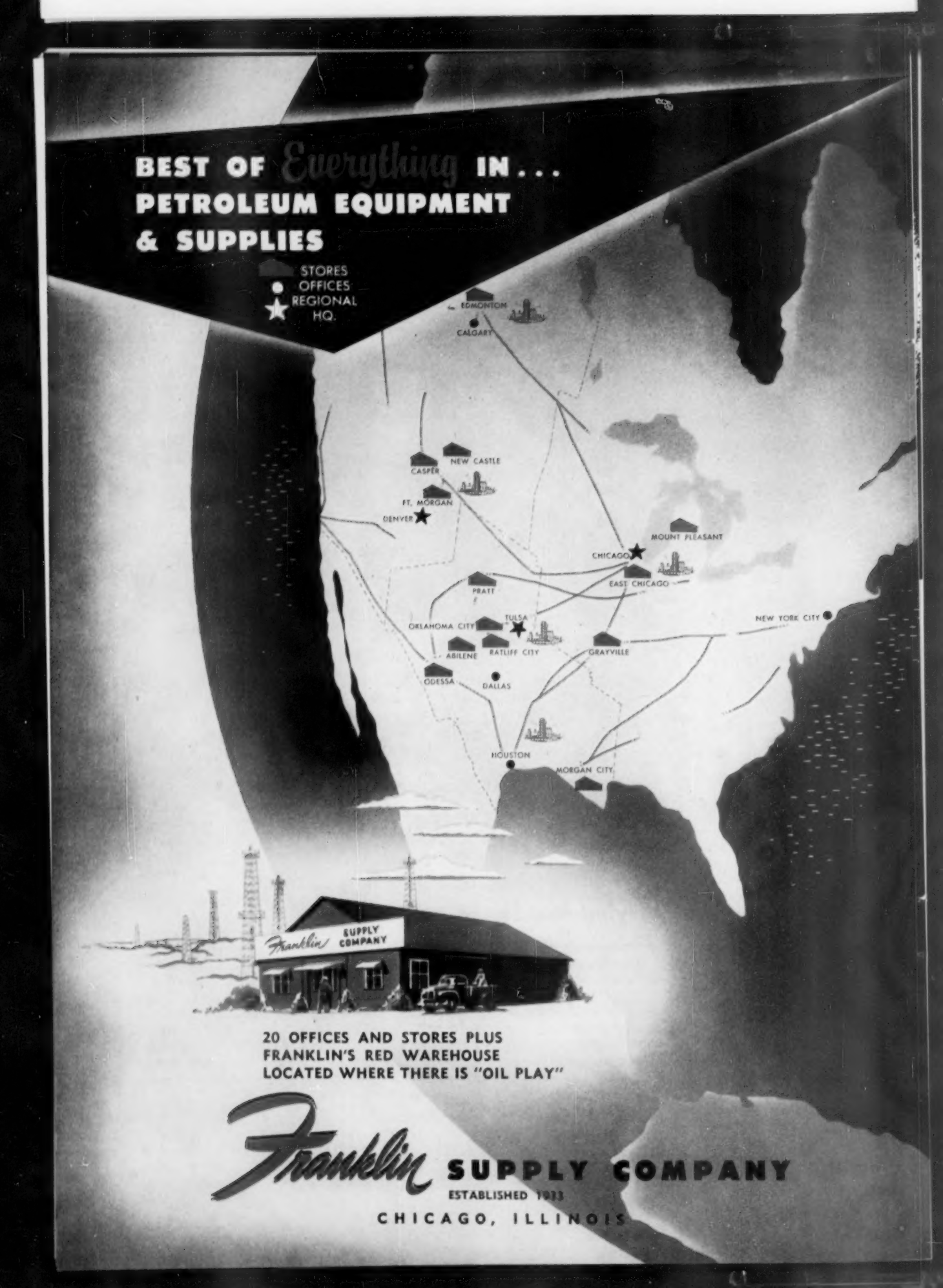
Today, new developments such as atomic power, jet engines and gas turbines pose new and complex lubrication problems. Socony Mobil Oil is proud that it's being called on to solve these problems and plans to continue to devote its facilities and products to keeping the wheels of the world moving.

The Leader in Lubrication for nearly a Century!

SOCONY MOBIL OIL COMPANY, INC.

BEST OF *Everything* IN... PETROLEUM EQUIPMENT & SUPPLIES

STORES
OFFICES
REGIONAL HQ.



20 OFFICES AND STORES PLUS
FRANKLIN'S RED WAREHOUSE
LOCATED WHERE THERE IS "OIL PLAY"

Franklin SUPPLY COMPANY

ESTABLISHED 1933

CHICAGO, ILLINOIS

NOW FOR DEEP OR HIGH PRESSURE WELLS:

HERE'S STEEL TUBING THAT WITHSTANDS INTERNAL PRESSURES UP TO 15,000 PSI

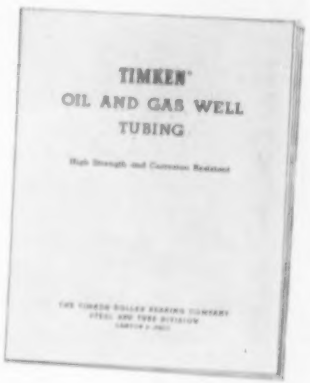
BECAUSE Timken® seamless steel tubing withstands internal pressures up to 15,000 psi, it's strong enough for the deepest wells being considered today. In fact, it's so strong that present wells can't fully test its strength.

While the strongest grade in the proposed revised API specification—5A—calls for 105,000 psi yield strength, Timken steel tubing can be furnished with a yield strength of 125,000 psi—20% stronger than the highest API grades!

Timken seamless steel tubing is furnished in a wide variety of sizes and analyses. Some analyses are specially chosen for corrosion resistance. All are ductile when properly heat-treated.

The Timken Company has already supplied tubing for a number of extremely deep or high pressure wells, with completely satisfactory results. And oil and gas well applications represent only a small part of our experience with high pressure seamless tubing. For more than 24 years, we've been making it for many other special requirements. Let us tell you about them.

FREE ENGINEERING STUDY. Timken Company metallurgists recently made a study of various alloys for high strength and corrosion-resistant tubing. A discussion of their findings, along with physical properties, appears in a booklet titled "Timken Oil and Gas Well Tubing". For your free copy, write to: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, O. Cable: "TIMROSCO".



YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

One reason why more Bucyrus-Erie spudders are in use today than any other make is their ability to make money on a wide range of jobs. They handle top-to-bottom drilling, well completion, and workover operations equally well and have the mobility to get around from job-to-job in a hurry.

FOR DRILLING top-to-bottom, they combine big capacity, ample power, and hard-hitting spudding motion to produce hole fast. Four models to suit your requirements: 48-L swings 6,000 lbs. tools, drills to 6,000 ft.; 36-L handles 4,200 lbs. tools, drills to 3,500 ft.; 28-L tool rating 3,000 lbs., depth 2,500 ft.; 60-L swings 2,750 lbs. tools, drills to 1,500 ft.

FOR DRILLING IN, Bucyrus-Erie spudders start working within a few hours after rotaries are moved off. Mobile single- and tandem-axle mountings (or easy moving skid-type base) cut a big slice off downtime and add it to working time. Setting up is quick and easy, too.

FOR SERVICING JOBS, three-drum arrangement with fast, powerful line pulls simplifies handling of tools, bailer, casing, tubing and rods. Two forward speeds and one reverse on all drums and catheads (except 60-L which has one speed forward and reverse) provide split-second control. 17555

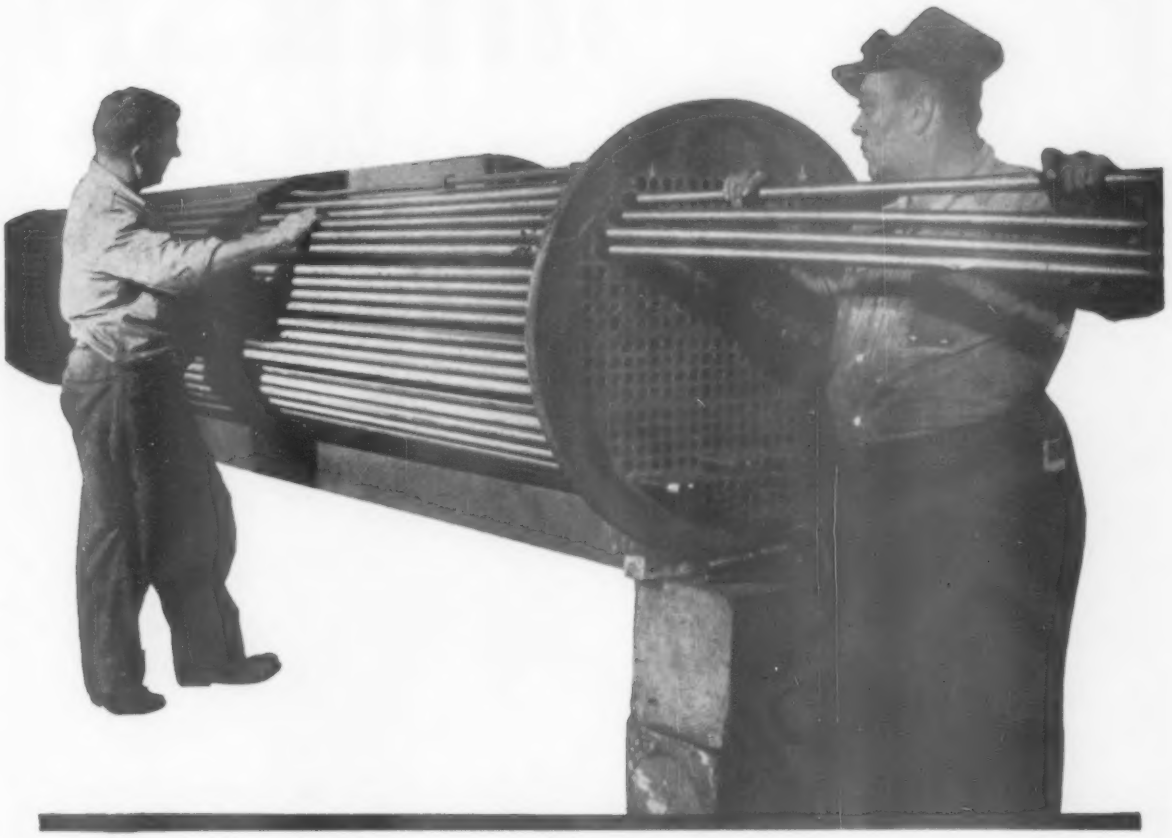
Put a Bucyrus-Erie spudder to work for you for reliable, versatile, profitable performance. Get detailed information from your Bucyrus-Erie spudder distributor.

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

TO MAINTAIN HIGH PRODUCTION

AND REDUCE DOWN-TIME...



ESSO installs 7,956 Anaconda Cupro Nickel, 30%-702 Tubes in condensers and coolers at Bayway Refinery

This condenser is used in the No. 1 Fluid Catalytic Cracking Unit at the Bayway Refinery of Esso Standard Oil Company at Linden, N. J. The unit produces about 25,000 barrels of petroleum products daily—ranging from high octane gasoline to heating oils.

7,956 ¾" Cupro Nickel, 30%-702 Tubes were supplied by Anaconda for the condensers and coolers of this cracking unit. On the shell side, these tubes are subjected to temperatures as high as 550°F at 75 PSI by process streams containing both sulfur and salt compounds. On the tube side, the summer salt water temperature ranges from 80°F at the inlet to 110°F at the outlet.

Information gathered from test runs within the refinery indicates these ANACONDA Cupro Nickel, 30%-702 Tubes have a life expectancy in this service of from 6 to 12 times greater than tubes made of Admiralty Alloy.

ANACONDA Cupro Nickel, 30%-702 Tubes are recommended where process liquids, vapors and cooling waters are corrosive—particularly where temperatures are too high for other copper alloys. Tubes of this alloy also have superior resistance to sea water at high velocities. They have good physical properties at elevated temperatures and resist stress-corrosion cracking.

Our files bulge with a collection of tube performance case histories that can answer many of the corrosion problems you face. We can put the information in these files to work for you at once—to help you select the one best alloy for your job. Write, outlining your operating conditions, to Dept. TD, The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass, Ltd., New Toronto, Ont. 5611

ANACONDA®

Tubes and Plates for Condensers and Heat Exchangers

MARSH

. . . the gauge with the "Recalibrator"

Any pressure gauge can be knocked out of adjustment, but when it's a Marsh Gauge you can quickly correct it with the twist of the "Recalibrator" screw.

This is not only the handiest way to correct a gauge; it is also the best way. Conventional methods of adjustment simply compensate for the error. The "Recalibrator" corrects the relationship between the movement and the bourdon tube—actually *does re-calibrate* the gauge.

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corporation* **Dept. L, Skokie, Ill.**
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta

Marsh products include a full line and range of gauges in pressure, compound, altitude, hydraulic, sprinkler, ammonia, retard, test and diaphragm types. Dial thermometers in rigid stem and remote reading types. Ask on your letterhead for new catalog just off the press.

STOP LINE KINKS WITH NEW LOW COST

CHIKSAN JR. SWIVEL JOINTS

ACTUAL SIZE ¾"

Need free swiveling action on air, coolant, liquid or hydraulic lines?

Then by all means investigate the new Chiksan Jr. Swivel Joints. Their astonishing low price is quickly repaid a hundred-fold in labor and material replacement costs. Chiksan Jr. No. 2, controlled torque design, illustrated above, is for use on flexible lines which are required to lock in any position.

Chiksan Jr. No. 1. Permanent clamp design for use on lines where free swiveling action is required.

- Available in ½" and ¾" sizes.
- Nipples and sleeve are Zamak #5. Resists corrosion. High tensile strength.
- Cadmium-plated clamps are rust resistant.
- "O" Rings will handle most fluids, oils, air, water. Other "O" Rings for special services.
- Maximum pressure 125 psi, maximum temp. 225° F.
- Select either permanent clamp or controlled torque design.
- Immediate delivery. Quantity prices.

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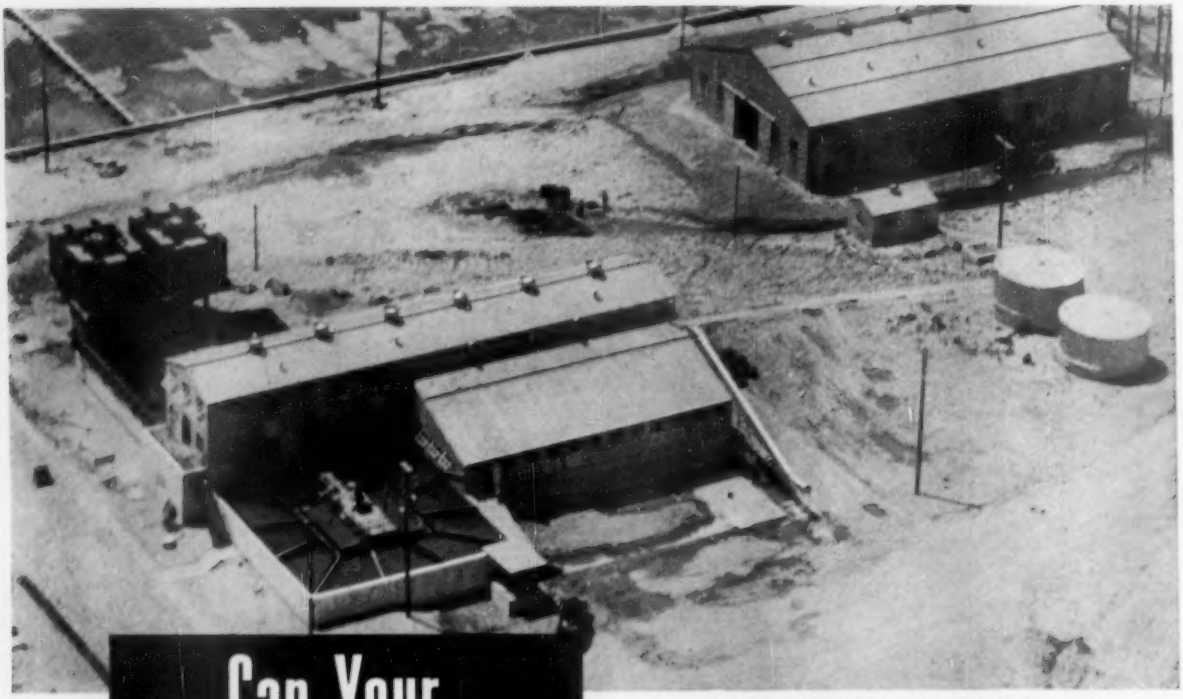

Typical INFILCO flooding water treatment plant includes: Forced Draft Aerators; "ACCELATOR" Treating Plants; Chemical Feeders and INFILCO Gravity Filter Plant.

Can Your Flooding Water Meet this Test?

1. Chemical stability
2. Oil content zero
3. Iron Content 0.2 parts per million
4. Turbidity 1 part per million

If not—you may be jeopardizing the success of your flood!

Most operators agree that these standards for the flooding medium (water, produced brine, or both) are necessary for minimizing clogging of the input formation. Closed systems, or other types of partial treatment, seldom meet these exacting requirements. INFILCO *complete* treating plants, which include the highly efficient ACCELATOR® Stabilizer, provide water within the specified limits. Existing INFILCO installations are treating over 500,000 barrels per day with three-way economy: lower first cost, lowest maintenance and low, low chemical costs. INFILCO engineers have over 30 years experience in designing *complete* flooding water treatment plants. Be sure you are getting maximum oil recovery by consulting your nearby INFILCO engineer. If you prefer, write for complete information.

INFILCO INC.

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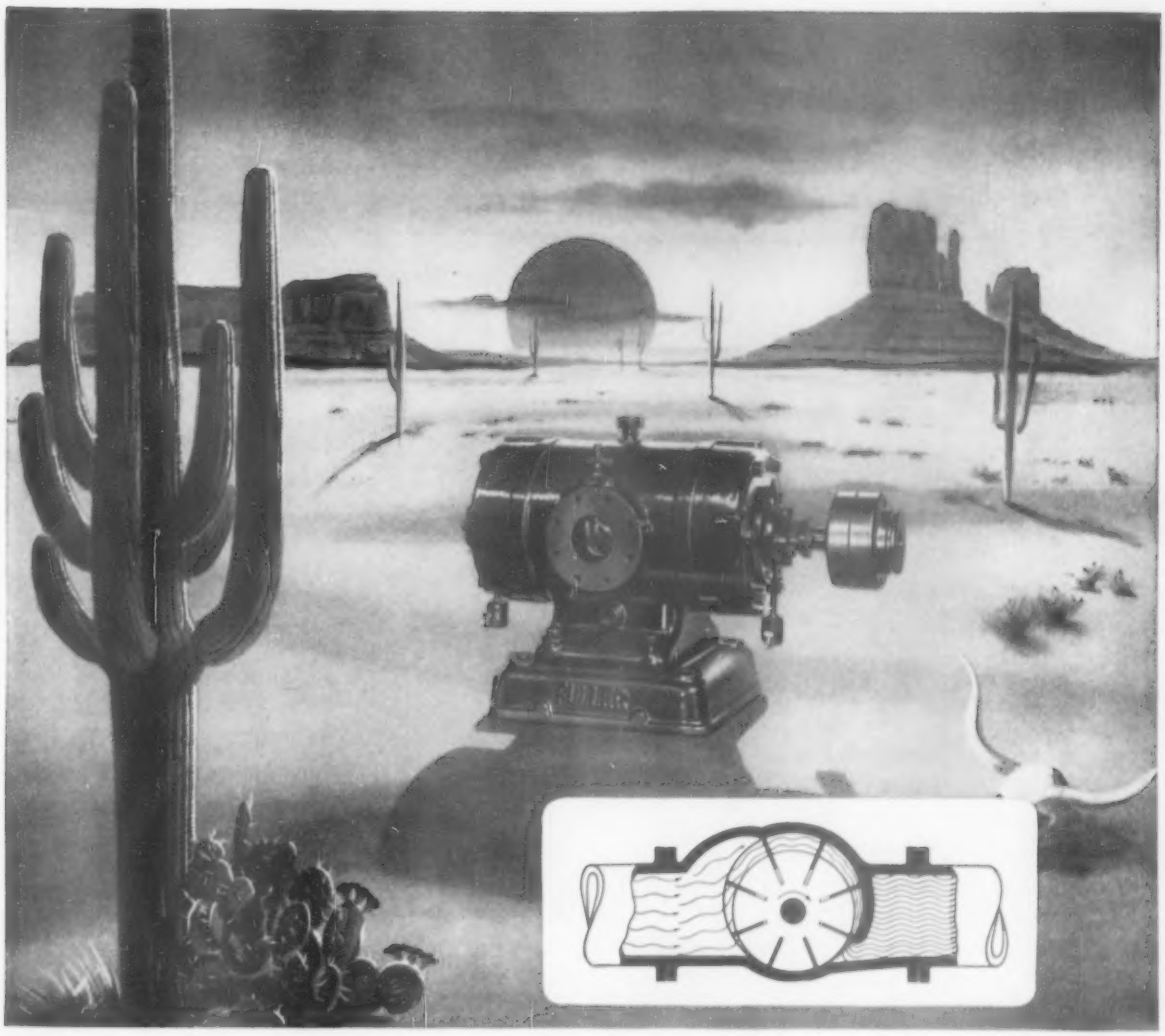
The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.



COMPRESSING AIR DAY AND NIGHT

With not a man in sight

For gas gathering and booster service at far-flung, out-of-the-way well heads, you need compressors capable of operating for long periods with absolute reliability and with a minimum of attention.

Fuller Rotary Compressors can be relied upon to keep the gas flowing, thanks to Fuller's simple rotary design and rugged construction, a minimum of moving parts—rotor, blades and bearings—and smooth, vibrationless operation.

Hundreds of installations throughout the oil fields attest to the high standard of performance set by these Rotaries—ample assurance of what you can expect when you specify Fuller.

Fuller

. . . . pioneers in harnessing AIR

FULLER COMPANY, Catasauqua, Pa.

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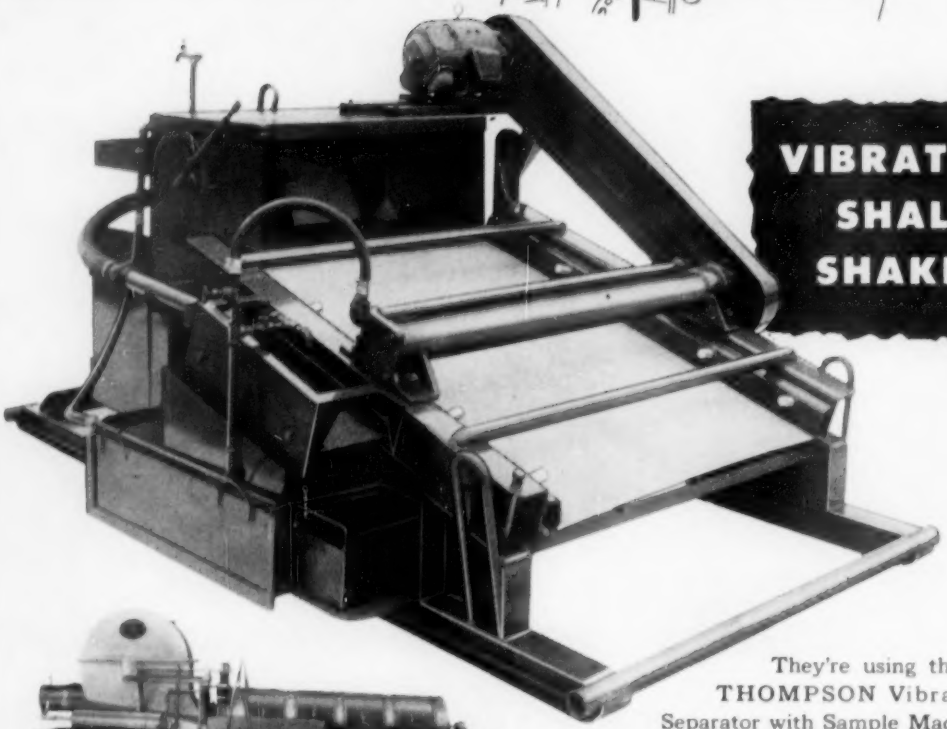
CUTS YOUR COSTS
ON EVERY DRILLING JOB

"YOU GET A TOP JOB
WITH A *THOMPSON*"

THAT'S WHAT DRILLERS AND
PROFIT-WISE OPERATORS
EVERYWHERE ARE SAYING.

"IT *WAS* A FAST, CLEAN, ECONOMICAL JOB
ALL THE WAY DOWN...A THOMPSON
Separator was on the Job!"



VIBRATING
SHALE
SHAKER

A THOMPSON Vibrating Shale Separator should be an important part of your standard drilling equipment. Each one is field-proven. Performance, as specified, is guaranteed, economy is a reality and its cost fits your budget.

They're using the Improved THOMPSON Vibrating Shale Separator with Sample Machine. It's an important part of their standard equipment. Wells are fed a steady flow of *clean* mud with a THOMPSON because its vibrating action effectively removes abrasives and shale from drilling muds. The Sample Machine supplies foot-by-foot specimens of formation cuttings. It's standard on all THOMPSON Separators unless otherwise specified.

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Manufacturer also
of the famous
THOMPSON Self-Motivating
Rotating Shale Separator
and Sample Machine.

Thompson
TOOL COMPANY
IOWA PARK, TEXAS

SOLD THROUGH SUPPLY STORES EVERYWHERE

Here is

EXTRA MOTOR VALUE

Double-shielded bearing
Large grease reservoirs
Bolted-on bearing cap
Labyrinth seals

This Allis-Chalmers Bearing Design Gives More for Your Motor Dollar

You can lubricate these bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at two points provide means for inserting new grease, flushing out old grease and relieving pressure during re-greasing.

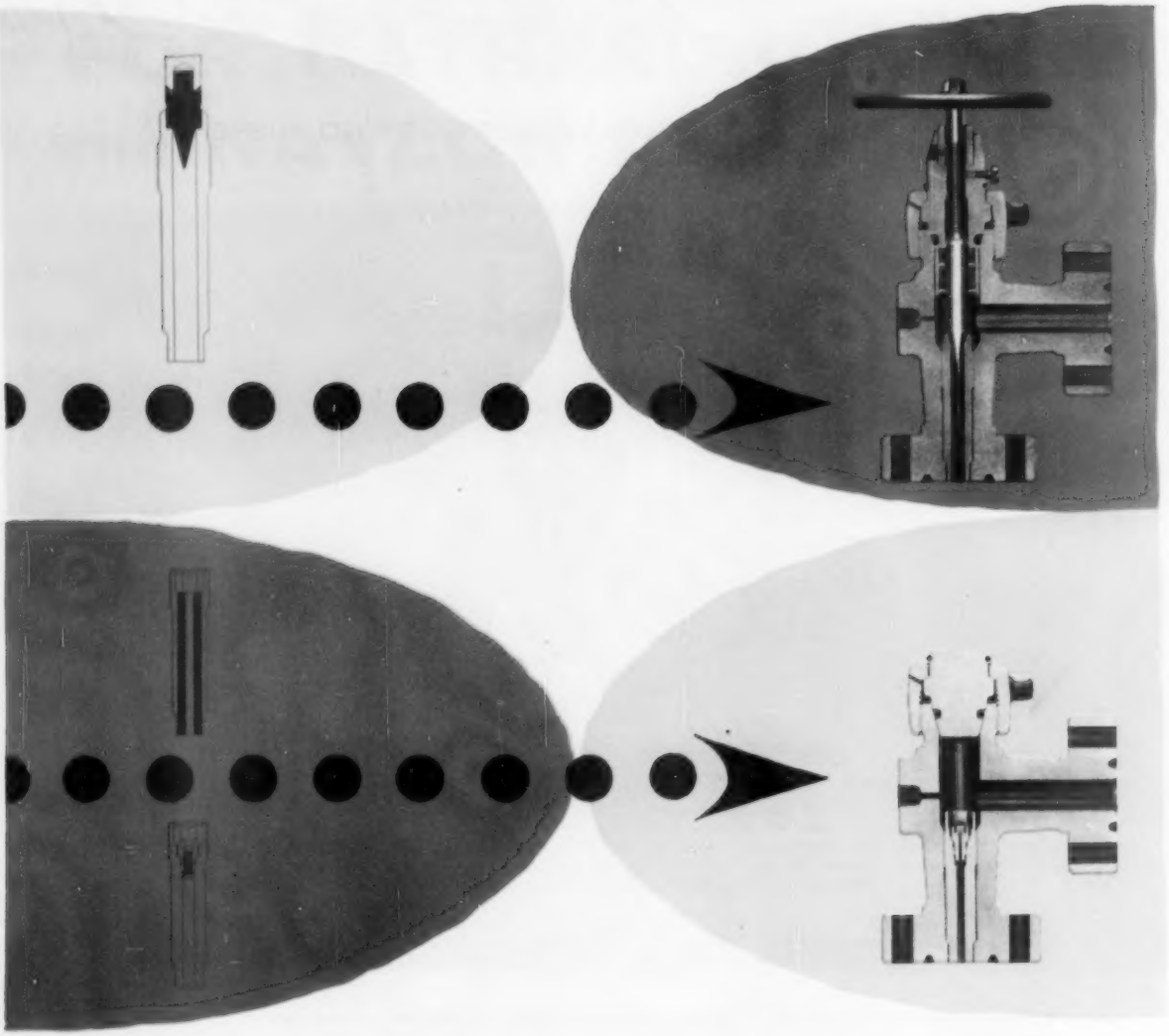
The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, minimizes the possibility of grease entering the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt barriers.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to give you the facts on this maintenance-saving design. Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin, for Bulletin 51B7286. A-4855

ALLIS-CHALMERS

Now you can get O•C•T quality in wear-resistant alloy trimmed chokes . . .



In scores of field tests, O•C•T chokes have proved superior to any other choke in wear-resistance

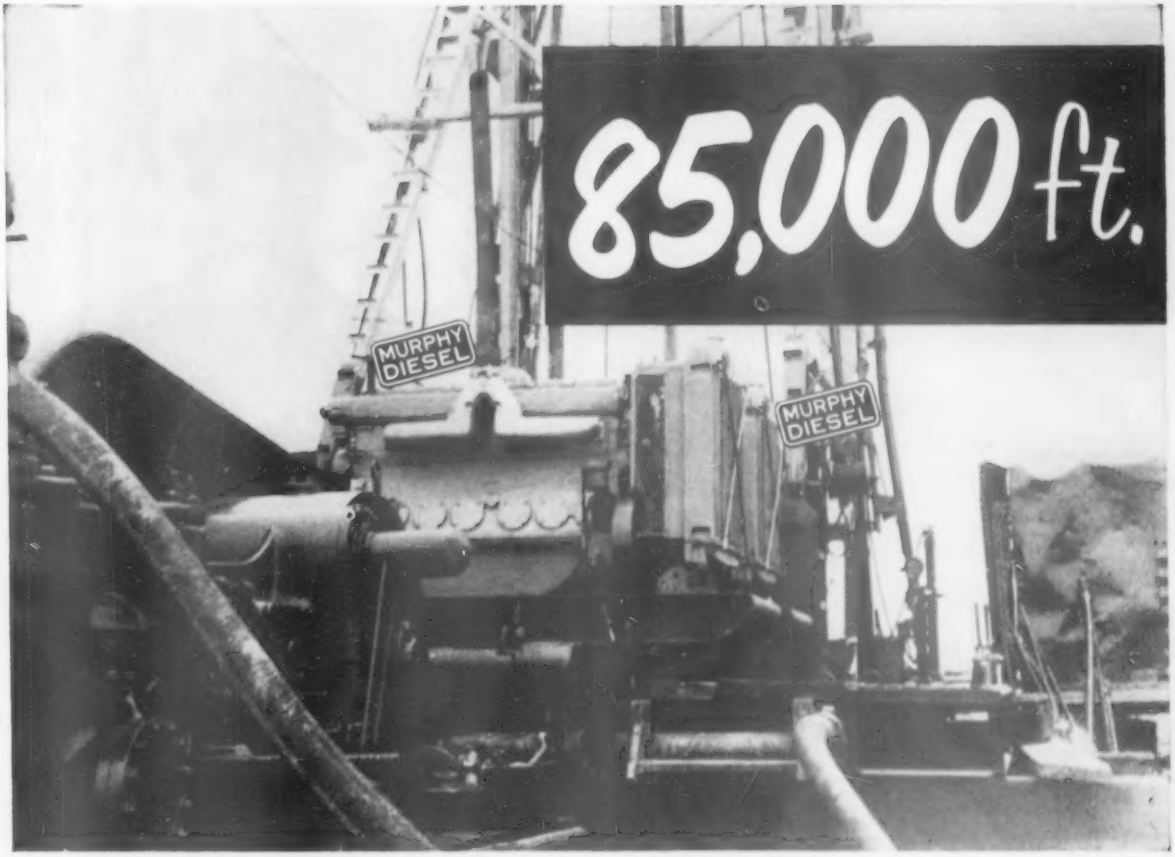
Now you can add greater wear-resistance to the other advantages . . . economy, speed, flexibility, strength and simplicity . . . that have made O-C-T Production Chokes the most popular in the field. Designed specifically to get the job done at extreme high pressures, these O-C-T Chokes will give you trouble-free, long life service under any field conditions you encounter. They're available through more than 700 supply store outlets . . . because more supply stores carry more O-C-T Chokes and choke parts than any other make.

O·C·T

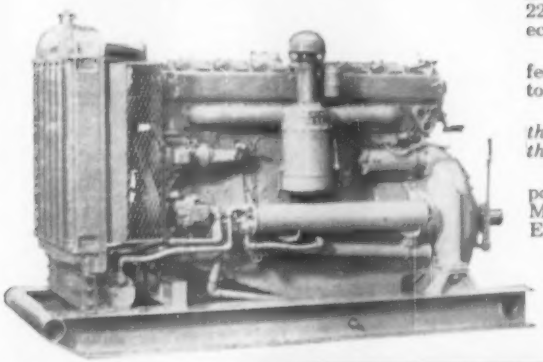
OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.



Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 96 to 248 H.P. Generator Sets, 60 to 155 K.W. Dual-Fuel Engines, 144 to 221 H.P.



MURPHY Diesels log unprecedented fuel economy for Greenland rig

The first hole made by Greenland Drilling Company of Great Bend, Kansas with their rig powered by two Model 22 Murphy Diesels was very enlightening. After drilling 3700 feet and using 2200 gallons of fuel they had their first experience with Murphy economy . . . approximately 7.9c fuel cost per foot of hole!

It has been going on ever since . . . at last report after 85,000 feet of hole over a 12 month period, Mr. Oscar Bridge had this to say:

"I have operated several different kinds of diesel power in this same area for the past seven years and I find that none of them will compare with our Murphys for fuel economy."

Why not find out more about how and why Murphy Diesel power can increase your drilling profits? Write for, or ask your Murphy dealer for, a copy of "10 Reasons Why Your Next Engine Should Be a Murphy."

MURPHY DIESEL COMPANY
5305 W. Burnham St. • Milwaukee 14, Wis.
FACTORY BRANCH—Sales Parts and Service: 113-117 So. Elwood St. Tulsa, Oklahoma

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MURPHY DIESEL

SEE YOUR MURPHY DIESEL DEALER, TODAY—

ALBUQUERQUE, NEW MEXICO, Lively Equipment Company; BUTTE, MONTANA, Hall-Perry Machinery Company; CORPUS CHRISTI, TEXAS, Houston Engine & Pump Company; DALLAS, TEXAS, Conley-Lott Machinery Co.; DENVER, COLORADO, Macdonald Equipment Co., Inc.; EDMONTON, ALBERTA, CANADA, Northern Engine & Equipment Co., Ltd.; GREAT BEND, KANSAS, Manufacturers Dist. Co.; GREAT FALLS, MONTANA, Hall-Perry Machinery Company; HOUSTON, TEXAS, Houston Engine & Pump Co., Inc.; JACKSON, MICHIGAN, Utility & Industrial Supply Co.; LOS ANGELES, CALIFORNIA, Industrial Engine Service; LUBBOCK, TEXAS, Conley-Lott Machinery Co.; SAN ANTONIO, TEXAS, The Roy Kleinner Company; BAKERSFIELD, CALIFORNIA, Glenn Rose Engine Service; ODESSA, TEXAS, Conley Lott Machinery Co., ODESSA, TEXAS, Harries Sales & Rental, P. O. Box 1568; LONGVIEW, TEXAS, Conley-Lott-Nichols Machinery Co.

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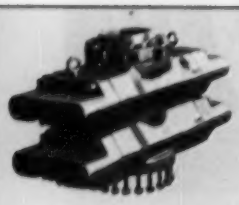

PRESSURE-OPERATED BLOWOUT PREVENTERS

PRESSURE-OPERATED GATE VALVES

MUD-LINE VALVES

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MUD-LINE PRESSURE GAUGES

COMPLETE FORGED STEEL CHRISTMAS TREES

IN A FULL RANGE OF PRESSURES AND SIZES

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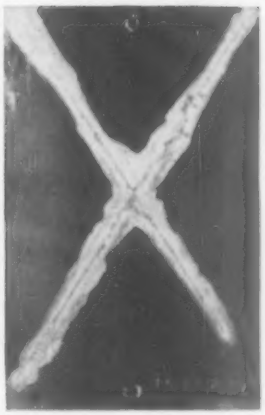
OUR 35th YEAR

PIONEERING - PERFECTING - PRODUCING BETTER PRESSURE CONTROLS FOR WORLD-WIDE DRILLING AND PRODUCTION.

WHICH TRUCK LASTS LONGER?



CORROSION spreads rapidly when paint was scratched, exposing untreated sheet metal.

DURIDIZED panel which got the same scratch shows how corrosion was prevented from spreading.

AUTOCAR, of course, with Heavy Gage Duridized Sheet Metal

Here's Why AUTOCARS Last and Last

Autocar sheet metal gets the special duridizing treatment in the modern, new Autocar plant at Exton, Pa. Then painted surfaces are baked in the infra-red ovens. To show what this means to Autocar life, special weathering tests conducted by Autocar engineers dramatically prove the superiority. The sheet metal panels shown above were painted under identical conditions and scratches made through the baked paint films into the base metal. The panels were then exposed to the elements. The results tell the long life story.

COMPARE these features, and you'll pick Autocar every time!

It's heavier-gage sheet metal than used on most other makes, but, more than that, there is extra care given Autocar sheet metal because of the *duridizing* process that produces on the cleaned metal surface a thin, hard chemical coating that increases paint life . . . resists corrosion and wear . . . provides a firm anchor for baked-on paint.

AUTOCAR TRUCKS

AUTOCAR DIVISION OF THE WHITE MOTOR COMPANY, EXTON, PA.

SEND ME FACTS THAT PROVE AUTOCAR LONG LIFE

AUTOCAR DIVISION, The White Motor Company
Exton, Pennsylvania

Please send me copy of new Autocar Facts Book

Name_____

Position_____

Firm_____

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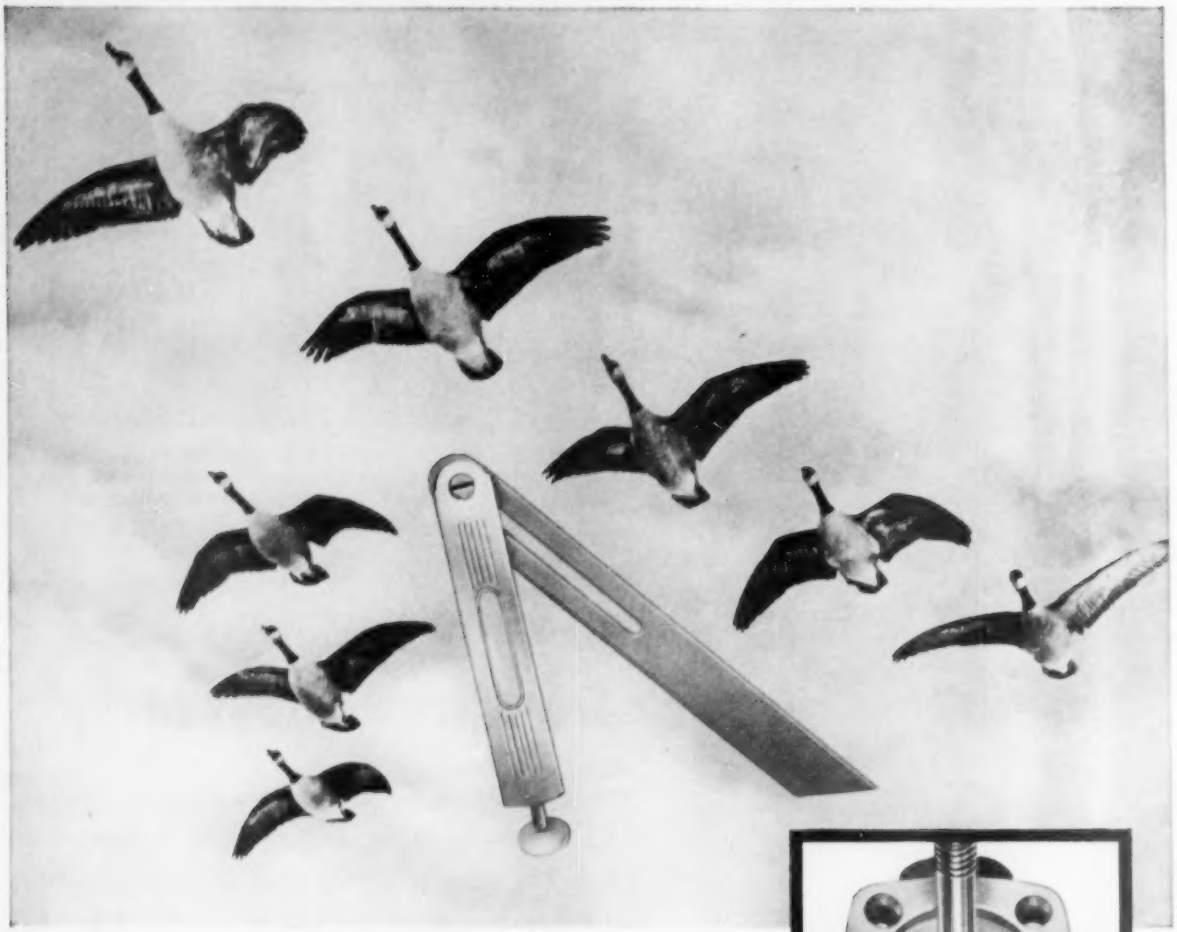
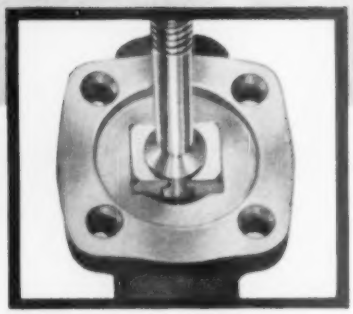
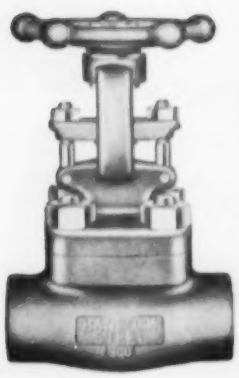
19.1

In England: British Oilfield Equipment Co., Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.





GUIDE-ABILITY
that means longer life



FULL GUIDING in the Type 950 Hancock Steel Gate Valve does not permit the wedge to gall, scuff, chip or wear the seating surfaces. Four accurately-machined grooves in the valve body guide the wedge to and from the seats and prevent wedge rotation. No matter how great the flow and pressure load or the rotating force exerted by turning the handwheel, the wedge corners do not hit or rub across the seating surfaces. This close-clearance guiding protects against seat damage that frequently causes other valves to leak in as few as one opening-and-closing operation at service pressures.

The provision for precise *full guiding* adheres to the principle that valve seats and wedges *should wear from long service, not from battering against each other.* It is one of many quality features that keep Type 950 Hancock Steel Gate Valves in the line longer. Your Industrial Supply Distributor will gladly demonstrate. Phone him today.

HANCOCK VALVES

A product of

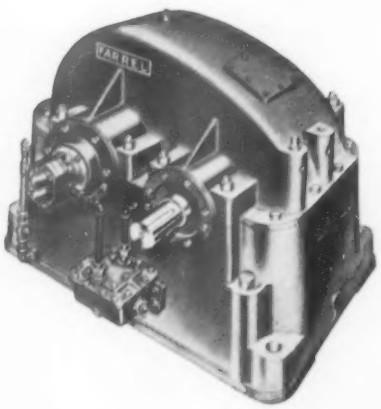
MANNING, MAXWELL & MOORE, INC.

Watertown 72, Massachusetts

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

NO. 1 REASON

why Farrel® speed increasers give nonstop service



The gears in a Farrel speed increaser are precision-generated by the famous Farrel-Sykes method—a process that assures extreme accuracy of tooth spacing, profile and helix angle. This high precision provides a virtual guarantee of long, trouble-free operation.

The continuous tooth herringbone design of the gears, assures evenly distributed pressure over each tooth, from tip to working depth line. Because this reduces the tendency of the teeth to wear unevenly, speed increaser life is prolonged.

Proof of the dependability of Farrel speed increasers is found in the record. Since 1932, when they were first put into service, not a single unit has ever had to be replaced.

For details of these *proved-on-the-job* speed increasers send for bulletin 448-A.

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Plants: Ansonia and Derby Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Fayetteville (N. C.), Los Angeles, Salt Lake City, New Orleans

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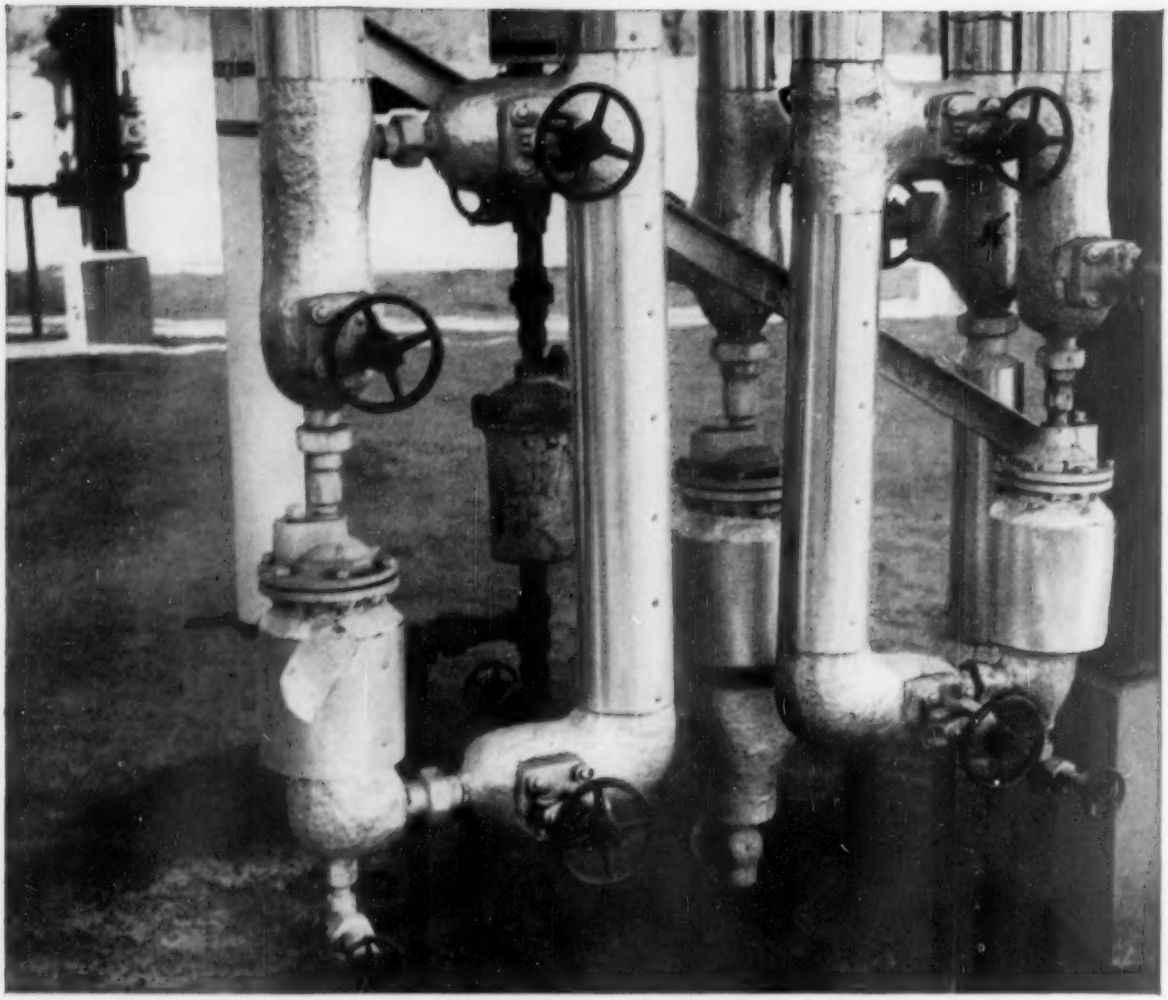


Picture of Low Cost Steam Trapping . . .

The Armstrong steam traps pictured above are in a field processing plant in Oklahoma. It's a nice installation —traps neatly installed in bypasses, lines well insulated, blowdown valve below each trap. Obviously, no corners have been cut to save nickels. Then, what do we mean by "picture of *low cost* steam trapping." Simply this:

Low cost traps—the price tag doesn't read any lower, but, because of high capacity, you can usually select an Armstrong trap one size smaller than other makes.

Low cost installation — Armstrong offers a choice of either side inlet-side outlet or bottom inlet-top outlet traps in most sizes so that hook-ups can be made with a minimum of labor and fittings. All traps can be equipped with internal check valves, and the three smallest traps are available in integral strainer style. These optional built-in features mean lower installation costs.

Low cost maintenance—Armstrong traps last for long periods without repairs because the valves and seats are corrosion-resistant, file-hard chrome steel, ground and then lapped together; and all other working parts are corrosion-resistant stainless steel. Materials and workmanship are unconditionally guaranteed.

Low production costs—because Armstrong traps provide fast drainage and have large air handling capacity, they provide maximum output from steam heated units and give a bigger return on equipment investment. They save steam, too, through reduction of non-productive radiation losses and freedom from leakage.

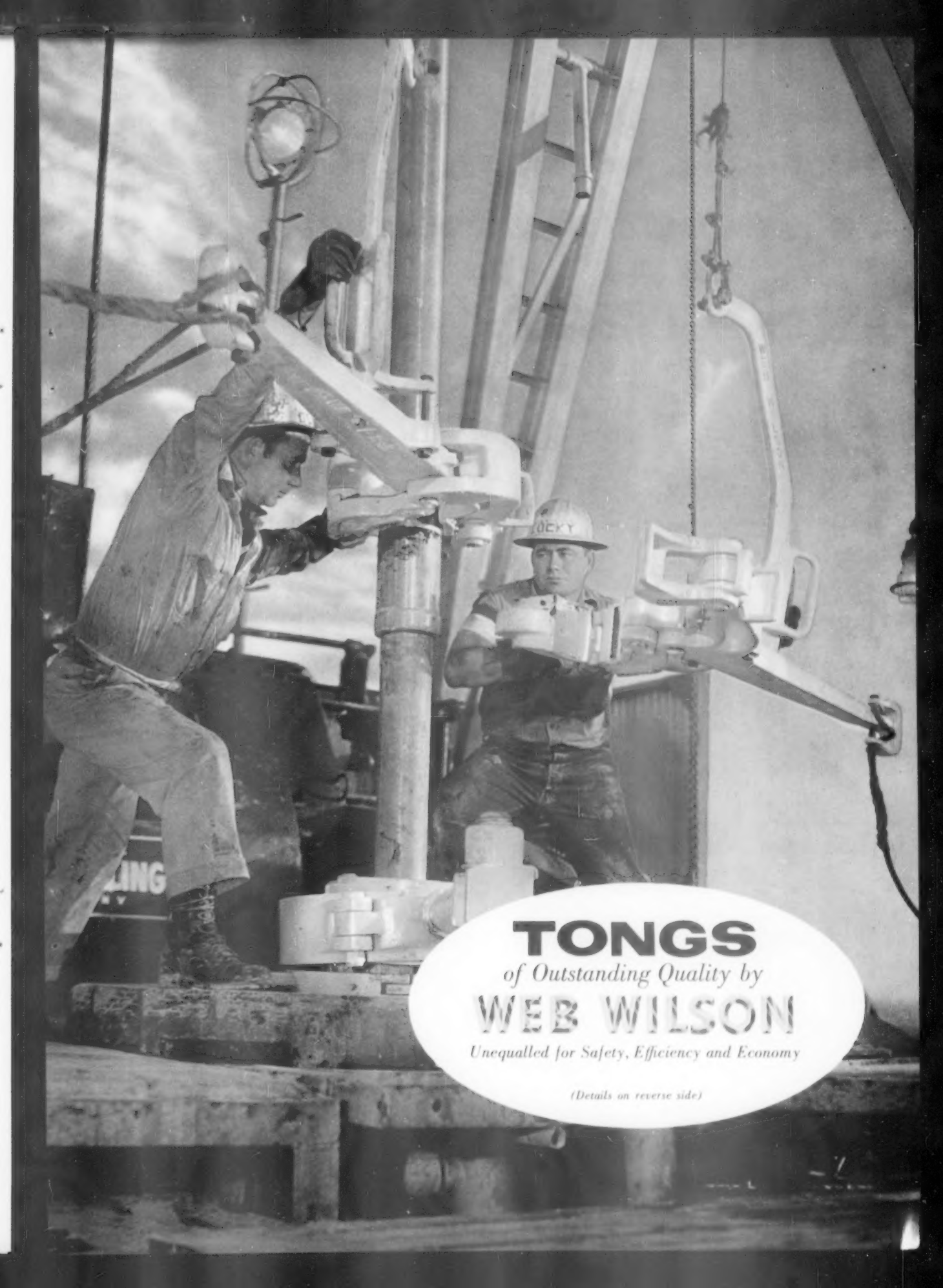
For *low cost* trapping it pays to specify "traps shall be Armstrong."

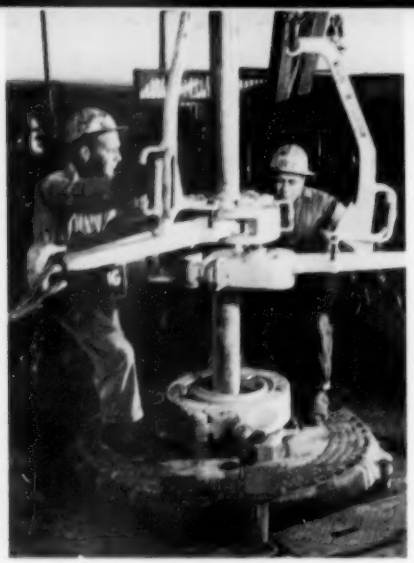
ARMSTRONG MACHINE WORKS
868 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

ASK FOR CATALOG

Complete selection, installation, maintenance and trap data in the useful 44-page Steam Trap Book. Call your local Armstrong Representative or write Armstrong Machine Works.


TONGS
of Outstanding Quality by
WEB WILSON
Unequalled for Safety, Efficiency and Economy
(Details on reverse side)



YOUR FIRST IMPRESSION OF

Quality...

...is proved by top performance

YOUR FIRST LOOK at *any* Web Wilson Tong tells you "it's right for the job" and your *first* impression will be confirmed by long, safe, economical operation.

Quality IN TONGS IS MADE UP OF MANY THINGS

"SPIRAL" HINGE PIN ARRANGEMENT which equalizes pressures of all jaws against the pipe, as well as stresses on tong pins and jaws. You enjoy far greater safety—longer tong life—repairs are less—pins and dies last longer.

QUALITY of materials, with Manganese-Molybdenum steel used for all parts, which are then heat treated in our own plant. All parts are "Magna-flux" inspected both before and after heat treatment, and "Gamma-rayed" (on a quality control basis) to detect any possible internal defects.

QUALITY IN BASIC DESIGN so that you need to change *only one* Lug Jaw—not the entire tong head—to cover a wide range of sizes. This means less inventory, less confusion, and less cost.

QUALITY IN OPERATING PERFORMANCE, with a strong, safe, guarded "Stirrup-Type" Latch and a Self-Locking Safety Latch which insures against unlatching under load. Positive balancing, and ease of opening and closing are added vital features.

QUALITY LUBRICATED TONG HINGE PINS made of alloy steel *exactly right* for the job. They are precision ground, heat treated in our own plant, and the countersunk lubrication fitting guards against accidental damage. Breakage is less—and they last and last.

QUALITY IN TONG DIES because all Web Wilson Tongs are equipped with the famous TIGER TOOTH Tong Dies, never equalled for positive, safe gripping and long, low-cost service. Don't hamper the performance of *any* Web Wilson Tong by using inferior imitation dies.

it will pay you well to buy only . . .

WEB WILSON
Quality...
TONGS
Rotary · Casing · Tubing

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WEB WILSON OIL TOOLS, INC. • LOS ANGELES • DALLAS • NEW YORK
MAIL ADDRESS: BOX 72096, LOS ANGELES 2, CALIFORNIA

Printed in U.S.A.

Superior Engines

provide many profitable, extra drilling hours between overhauls because . . .

Superior Diesel or Dual Fuel Drilling Engines are available from 300 to 650 Continuous B.H.P., Superior Gas Drilling Engines from 320 to 630 Continuous B.H.P.

Great engine accessibility and simple rugged construction make routine maintenance quick and easy—right on the rig! Features such as dynamically balanced crankshaft, heavily reinforced cylinder block, individual cylinder heads and fuel pumps for greater dependability, and sturdy engine bed which takes the Diesel firing thrust, to mention a few, greatly lengthen the time between engine overhauls.

Case histories prove, when Superior engines finally need overhauls, they require few major part replacements . . . down time and maintenance costs are cut to a minimum.

Buy Superior Engines and you make a superior investment! Get all the facts from leading rig manufacturers, or through White Diesel field representatives available in all oil field areas or through White Diesel Engine Division.

WHITE DIESEL ENGINE DIVISION

THE WHITE MOTOR COMPANY • *Plant and General Offices: Springfield, Ohio*

Superior ENGINES ATLAS Imperial DIESEL ENGINES White DIESEL

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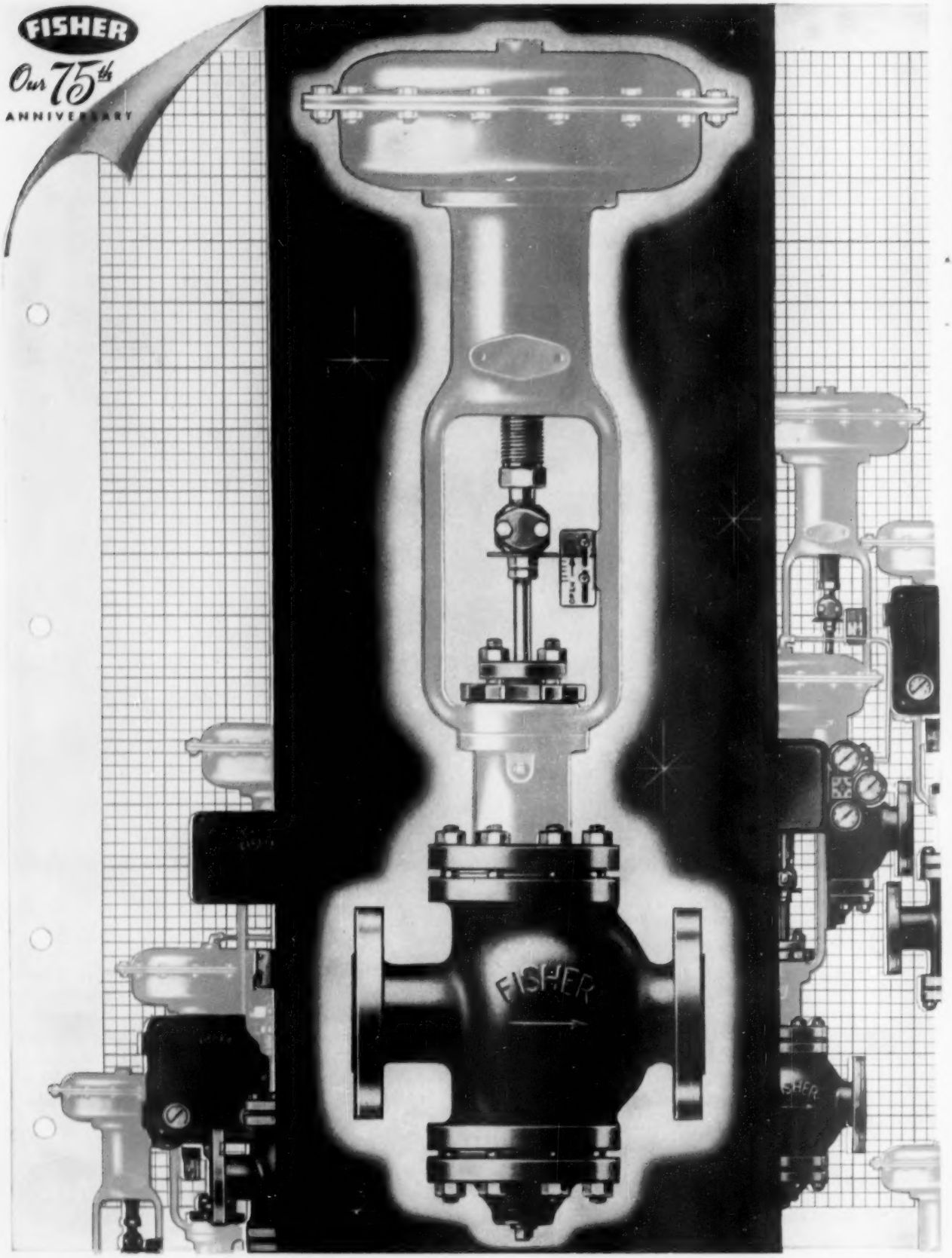

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Presents An Improved

DIAPHRAGM MOTOR VALVE OPERATOR

Bolted-clamp type stem connection. This allows large latitude in valve stroke adjustment. It can be disconnected in the field without damage to the stem. It will not shake loose from vibration or rotational inner valve forces.

• Rugged body to yoke connection with hammer lug nut. • Deep drawn steel diaphragm casings. • Specially designed molded diaphragms. • Bolted gland stuffing box with Teflon packing. • Improved clear view travel indicator. • Spring ranges: 3 to 15 psi; 3 to 27 psi; 6 to 30 psi.

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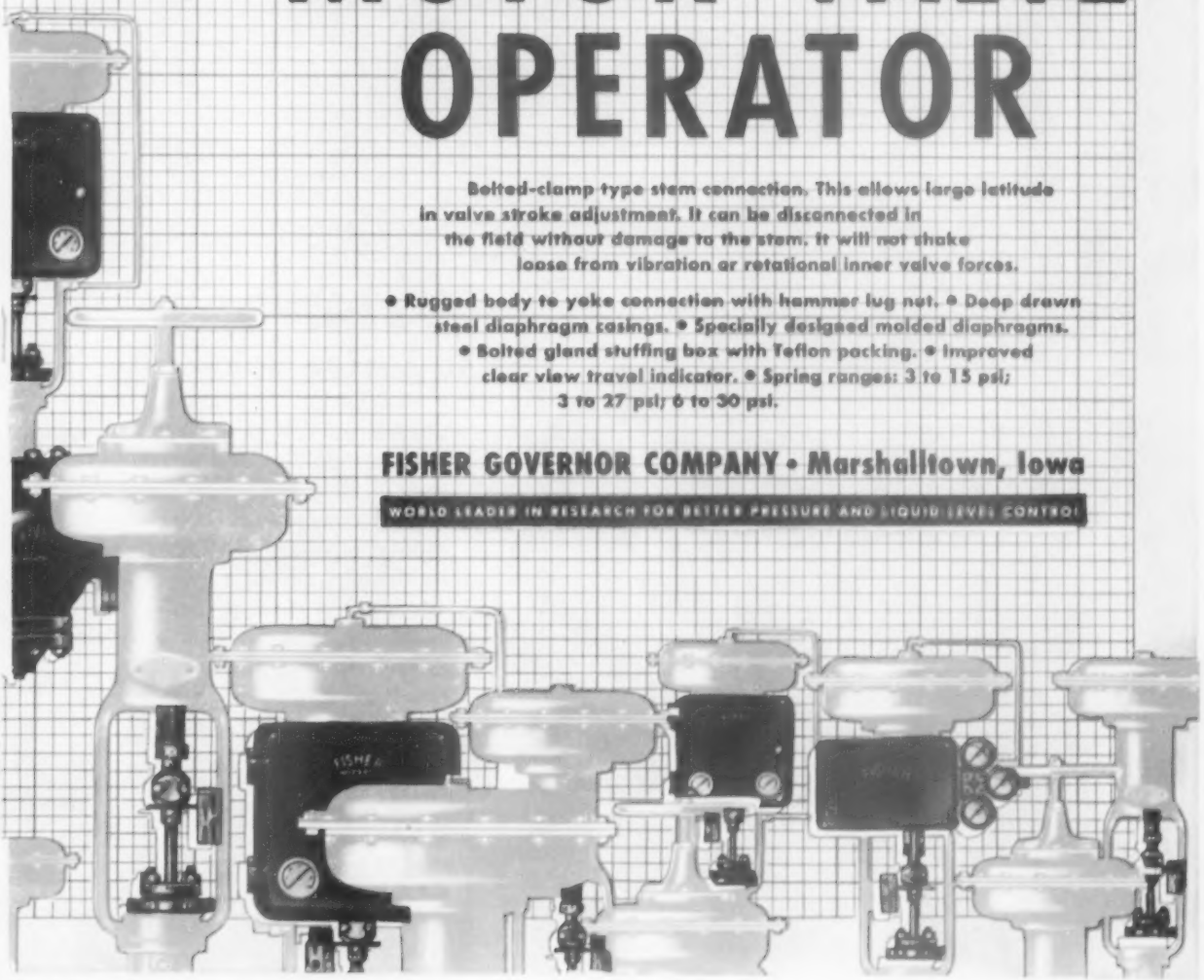
WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL



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AND *Manufacturing* COMPANY
TULSA, OKLAHOMA

They Say—

What Trans-Canada Faces

"The (Canadian) government's new pipeline plan . . . will be judged by results. If, as some of the more optimistic reports have been saying, it gets the trans-Canada gas pipeline started next spring and brought through Ontario by the end of 1957, then it will have proved itself to be at least a practical way of overcoming the very real and enormous difficulties. But it would be childish to assume that that result is already assured. There are several formidable hurdles.

"The first hurdle is that consent of the Ontario Government is needed. Of its readiness in principle to cooperate with Ottawa in establishing a crown company to bridge the difficult northern Ontario country there can be no doubt . . .

"The second consent request is that of the federal parliament and the Ontario legislature, for without their agreement the governments cannot put the money to form the crown company which is to build the Ontario link . . .

"The third consent is the most serious because it is outside Canada.

"The present plan is completely dependent upon the Federal Power Commission . . . whose declared duty is to protect the interests of American gas consumers and producers.

"Not much more than a year ago Ottawa was insisting that it would never allow the all-Canadian gas pipeline to depend on the FPC. Now it is putting up a plan which requires FPC approval for three separate trans-border transactions . . .

"If it comes out all right, the public will accept this plan. If the U. S. approvals are held up, as they still could be, things will look very different. The government is taking quite a gamble."

Editorial in Toronto's Financial Post.

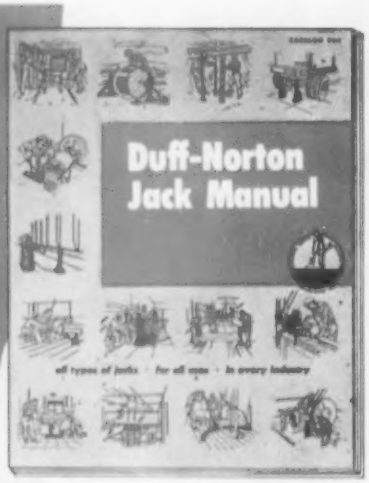
S.A.R.O.M. at Ravenna

Dear Sir:

It was with great interest that we have read the article "Octane Pace Quickens" in the August 1 Oil and Gas Journal, page 64, and we are pleased by the special relief given to the efficiency of our refinery at Ravenna, Italy.

While we are thanking you very much for this attention, we want for the safety of exactness let you know that the number of the barrels treated by the Houdriformer in our refinery of

How to Reduce Jacking Costs!



Do you know about the new power jacks? The remote controlled hydraulic jacks? Jacks that lower loads automatically, safely and quickly? Do you know how to select the right jack for the job at hand? How to instruct workmen on the safe use of jacks and how to keep jacks in good working order? Duff-Norton, the world's oldest and largest manufacturer of all types of lifting jacks for every industrial use, has just published a new 40-page, illustrated jack manual—the most complete encyclopedia on the subject of lifting jacks ever attempted. This new manual contains complete specifications on more than 300 different types and sizes of ratchet, screw, and hydraulic jacks from 3 to 100 ton capacities, both manual and power operated. It contains 40 pages of useful information that will enable you to get lifting, lowering, pushing and pulling jobs done faster, safer, at lower cost. Write today for your copy of this new jack manual. It's yours for the asking!

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Jacks

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Send immediately a copy of your new jack manual without cost or obligation to:

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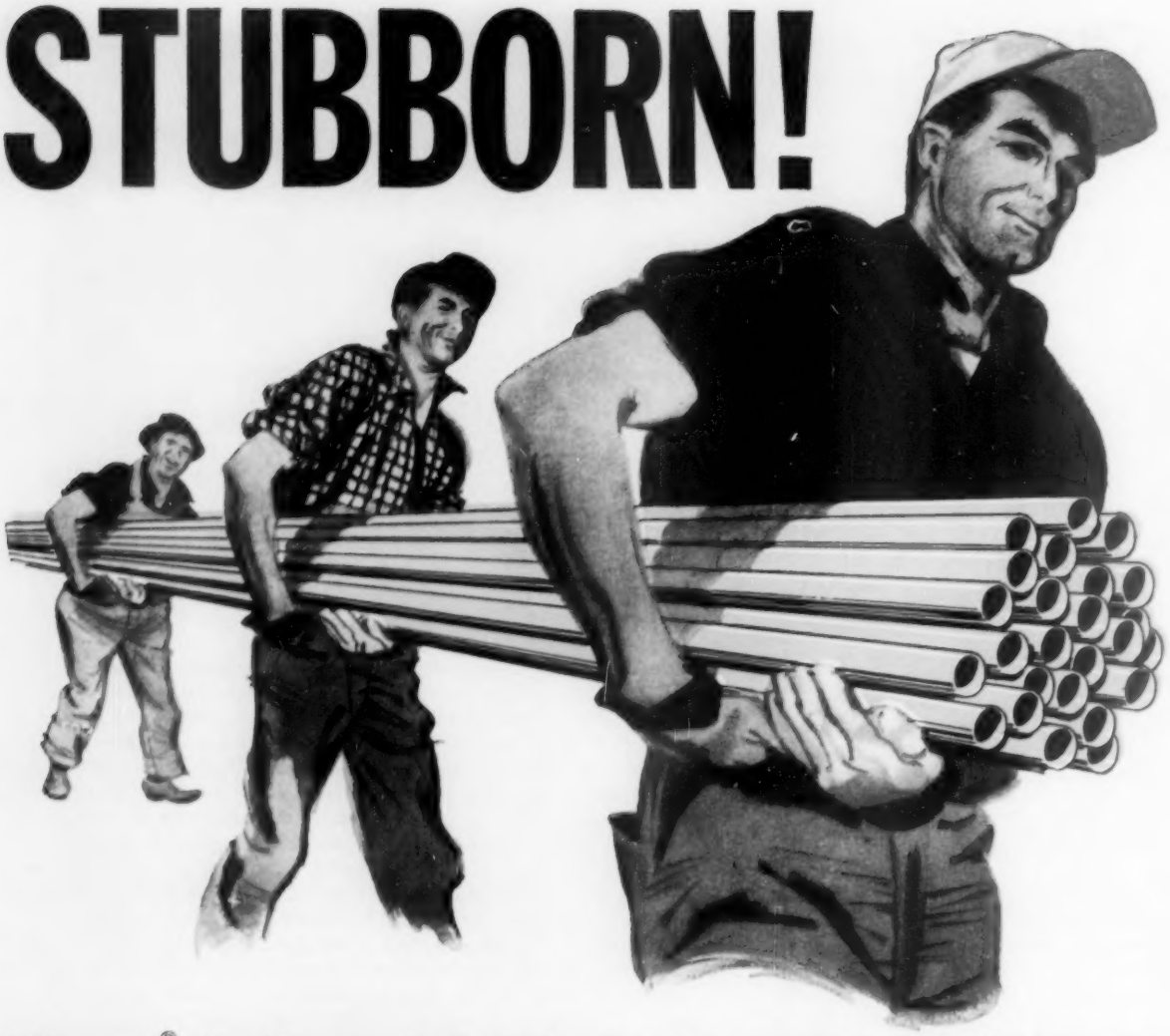

Chase® Antimonial Admiralty Heat Exchanger Tubes *RESIST DEZINCIFICATION!*

Dezincification holds no fears for the users of Chase Antimonial Admiralty Heat Exchanger Tubes! For *this* special alloy can give *years* of extra service under the most corrosive conditions!

Rugged testing in Chase laboratories, plus careful manufacturing in Chase mills, team up to give Chase Antimonial Admiralty a longer, healthier life span. To you, this can mean lower operating costs, fewer breakdowns, longer waits between tube replacements.

Enjoy these benefits! Insist on Chase Antimonial Admiralty!

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*Handled by Standard Brass & Mfg. Co. **Handled by Vinson Supply Co.

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Baltimore	Cleveland	Houston	Milwaukee	Philadelphia	San Francisco
Boston	Dallas	Indianapolis	Minneapolis	Pittsburgh	Seattle
Charlotte†	Denver	Kansas City, Mo.	Newark	Providence	Waterbury

Ravenna amounts to 4,300 bbl. a day, and that the actual efficiency of production in our refinery is not one of 13,500 bbl. a day, but one of 35,000.

We should feel very obliged for your kind rectification of these facts in . . . your journal . . .

Director General
S.A.R.O.M.
Soc. Arizonaria Raffinazione
Olii Minerali
Milan, Italy.

Editor's Note: The Journal's sincere apologies to S.A.R.O.M. We are correcting our data on the Ravenna refinery.

The FPC's Latest Ruling

"This ruling by the commission gives further definite evidence that only by passage of the natural-gas bill can the rights of the states over regulations and conservation of their natural resources be protected . . .

"The passage of the natural-gas bill to completely exempt production and gathering activities from federal regulations would clarify the law as the authors of the original natural-gas act intended it to be.

"The Supreme Court decision in the Phillips Petroleum case and now the FPC decision of Friday clearly go far beyond the intent of Congress."

Sen. Mike Monroney of Oklahoma in a statement issued after the FPC turned down petitions from Deep South, Humble, and Shell seeking exemption of federal control of gas sales.

The Oil Man and the Farmer

"In my opinion the revolution in agriculture, powered by petroleum, amazing as it has been, still has quite a way to go. The old frontier has disappeared. There is little more good virgin land to plow. But for science there is always as open frontier. The possibilities of new crops, new cropping methods, and new and better methods of doing everything in both your industry and mine are limited mainly by the amounts of money and length of time we spend on research . . .

"Farmers and oil men are not only partners in feeding and clothing the people; they are closely akin in their political philosophy. I believe they will stand together on this platform: That, if big government will let them run their own affairs to the maximum extent compatible with our national concepts of freedom, they will continue to perform miracles of production in both petroleum and agriculture.

"I hope that you who are teachers of agriculture and you who are traders

... loves 'em all!

.. AND MORE, *too!!*

Muds that will withstand a high degree of contamination by gypsum, lime, anhydrite, limey shales, clays, cement, and salt are possible when you use Marathon's Calcium Lignosulfonate as a conditioner.

This outstanding dispersant reduces viscosity, gel strength and water loss in lime-treated drilling fluids. It performs well in both conventional lime muds and low lime, low caustic muds. It is also an excellent stabilizer for water base emulsion muds.

Whenever you encounter difficult drilling conditions, switch to a lime treated or emulsion mud prepared with Marathon's Calcium Lignosulfonate. It's available under the tradename Kembreak†.

KEMBREAK†
may be obtained from

MAGNET COVE BARIUM CORP.
HOUSTON, TEXAS

MILWHITE MUD SALES CO.
HOUSTON, TEXAS

†Reg. T.M., Accuracy Rig Tool Company

MARATHON *Corporation*
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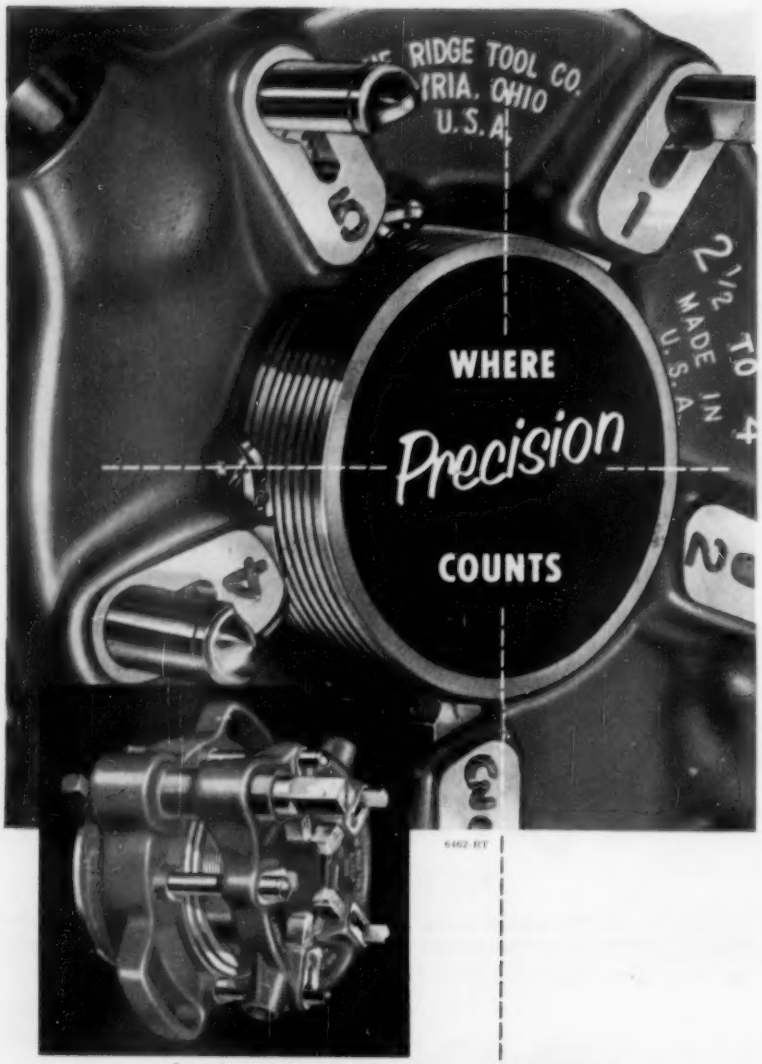
ROTHSCHILD • WISCONSIN



...use the RIDGID 4P

2½" TO 4" GEARED PIPE THREADER

Here's a work-saving precision tool that cuts accurate threads on 2½" to 4" pipe *every time.* It's easy to handle . . . easy to use . . . foolproof.

Operated manually or with power, the RIDGID 4P reduces time, sweat and scrap in any piping job. Balanced handles simplify carrying and starting on pipe. Mistake-proof workholder sets to size *before* tool is put on pipe . . . has only one screw to tighten . . . no bushings.

For precision and speed . . . you can't beat the RIDGID *4P!*

See your local supplier . . . or write direct for catalog.

RIDGID
WORK-SAVER PIPE TOOLS

MANUFACTURED BY THE RIDGE TOOL CO. • 537 CLARK STREET • ELYRIA, OHIO

in agricultural commodities will battle for the political freedom that will permit continuation of the agricultural revolution."

Robert E. Wilson, chairman of the board, Standard Oil Co. (Ind.), in an address given in Chicago before the 8th annual symposium of the Board of Trade of the city of Chicago.

CALENDAR OF EVENTS

SEPTEMBER

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-4 Gas Measurement Institute, sponsored by University of Kansas and Southwest Kansas Petroleum Industry, Legion Hall, Liberal, Kan.

3-6 Society of Exploration Geophysicists, 25th annual meeting, Shirley Savoy Hotel, Denver.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

14-15 National Society of Professional Engineers fall meeting, Peabody Hotel, Memphis, Tenn.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-21 National Association of Corrosion Engineers, South Central regional meeting, Shamrock-Hilton Hotel, Houston.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

BP POWERS THE PLANES

BP MEANS POWER in the air ; power for jets, turbo-prop and piston-engined aircraft.

The BP Aviation Service provides the power for many well-known national airlines. Its green and yellow symbol stands for swift and efficient service on airfields in places as far apart as Iceland and Fiji.

In the air, on land and at sea, BP products and BP research are speeding the pace of progress all over the world.

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Nothing but the finest will bear the name of

SLUSH PUMP VALVES • VALVE SPRINGS • VALVE SEAT PULLERS • PISTONS • PISTON RODS

Just as an expertly honed razor, with a perfectly smooth surface shaves cleanly without doing any damage — the precisely honed bores of ***Mission Super-Service**** ***Liners*** with ultra smooth ***Satin Finish**** let pistons operate smoothly and offer no uneven or jagged surfaces that start wear and cause failure in liners and piston rubbers. That's why ***Mission Super-Service**** ***Liners*** with ***Satin Finish**** cut down time and give performance far superior to ordinary liners.

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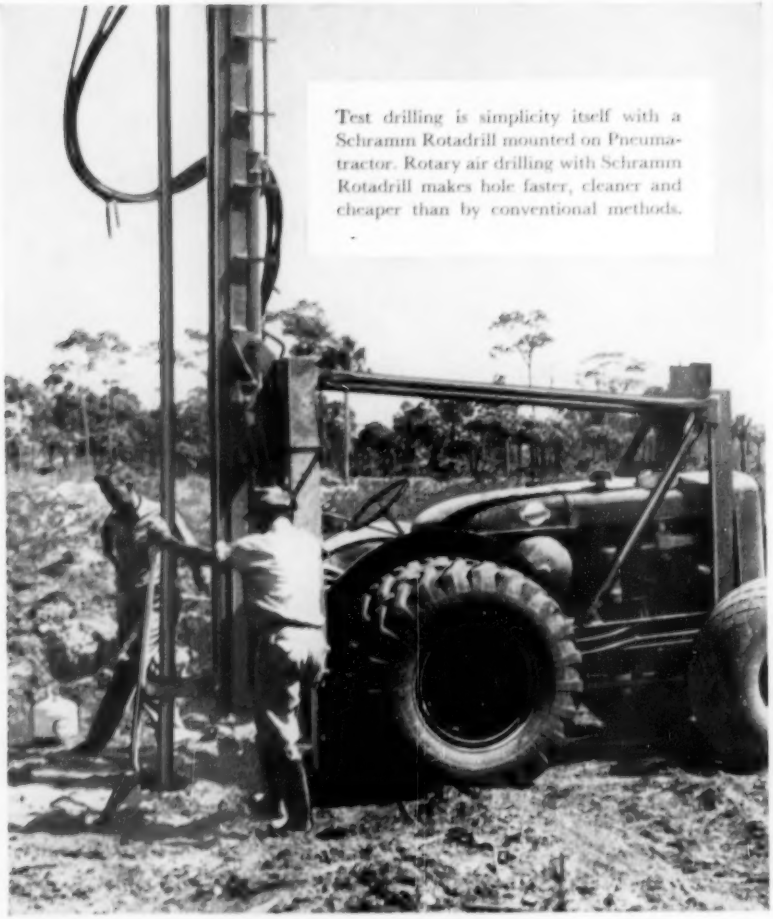

Test drilling is simplicity itself with a Schramm Rotadrill mounted on Pneumatractor. Rotary air drilling with Schramm Rotadrill makes hole faster, cleaner and cheaper than by conventional methods.

SELF-PROPELLED. The new Schramm Rotadrill is mounted on the Schramm Heavy Pneumatractor. Special weight boxes, dual wheels and the use of calcium chloride in rear tires add necessary weight to provide 10,000 lbs. down pressure. Schramm Rotadrill is also available truck mounted.

CONVENIENT, SIMPLE CONTROLS. Drilling controls are mounted in one bank, with pressure regulator and hydraulic gauge for controlling down-feed. Separate valves control each outrigger, forward and reverse rotations motor, slow downfeed, rapid downfeed and breakout cylinder.

EXPLORATION CREWS SET NEW RECORDS:

Drill test holes fastest ever with self-propelled drilling rig

With the development of the new Schramm Rotadrill, exploration crews gain all the advantages of rotary test drilling with compressed air. This comparatively new technique, developed in the oil fields, has been setting drilling records in almost every case. It is believed that rotary rock drilling, with its advantages of fast, clean holes, fast set-up, and longer bit life, will completely replace the use of wagon drills.

Schramm's new Rotadrill on Pneumatractor is a complete, self-contained unit, self-propelled and self-powered. The unit can drill a 4¼" hole, or smaller, to a depth of 500 feet with 10,000 pounds down pressure. Normal compressed air drilling pressures of 20-30 psi can be instantly increased for dewatering or breaking out blockages. Drilling controls are mounted in one complete bank, conveniently located for one-man operation. Standard Rotative Head has 75 RPM output and can be throttled down to complete stall while maintaining constant torque. Heavy welded structural steel mast, lowered for traveling between jobs, can be operated at various angles for sloping holes.

If you use wagon drills, you will find it worth while to investigate the Schramm Rotadrill on Pneumatractor. Send today for Bulletin PR-55. There is no obligation.

ADDING PIPE. Fast vertical action of rotative head serves as pipe hoist for adding pipe or pulling drill string. Output spindle is flanged to take various drill pipe adaptors.

Your local Schramm Dealer is listed in the Yellow Pages of your Telephone Directory.

Schramm, Inc.

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630 North Garfield Avenue

West Chester, Pa.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

20-Nov. 3 Atomic Energy Exposition, Carnegie Endowment International Center, Nations Plaza, 46 St. & First Ave., New York City.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

3-4 Fourth annual instrumentation conference, School of Engineering, Louisiana Polytechnic Institute, Ruston, La.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

11-13 New Mexico Geological Society, in conjunction with Roswell Geological Society, sixth annual field conference, Truth or Consequences, N. M.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

DECEMBER

1-3 American Chemical Society, 11th southwest meeting, Shamrock Hotel, Houston.

2 Natural Gasoline Association of America, Panhandle-Plains meeting, Herring Hotel, Amarillo, Tex.

8-9 Oil Industry Information Committee meeting, Biltmore Hotel, New York City.

1956

JANUARY

16-18 Pipe Line Contractors Association, eighth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

FEBRUARY

15-17 National Association of Corrosion Engineers Short Course for Pipeliners, Mayo Hotel, Tulsa.

19-23 American Institute of Mining and Metallurgical Engineers, annual meeting, Hotel Statler, New York City.

24 Natural Gasoline Association of America, Permian Basin meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Institute of Cremical Engineers, Statler Hotel, Los Angeles.

Extra Horsepower?

Specify Cummins New VT-12 Diesel

DELIVERING 600 HP AT 2100 RPM

TURBOCHARGING provides extra horsepower at the flywheel without corresponding increase in engine load. Cummins advanced engineering provides more horsepower per pound of engine weight. New PT Fuel System means easy servicing, low cost maintenance. Contact your nearest Cummins Sales & Service branch or write to . . .

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NEW KAISER ALUMINUM PIPE AND COUPLERS CUT INSTALLATION COSTS $219 PER MILE!

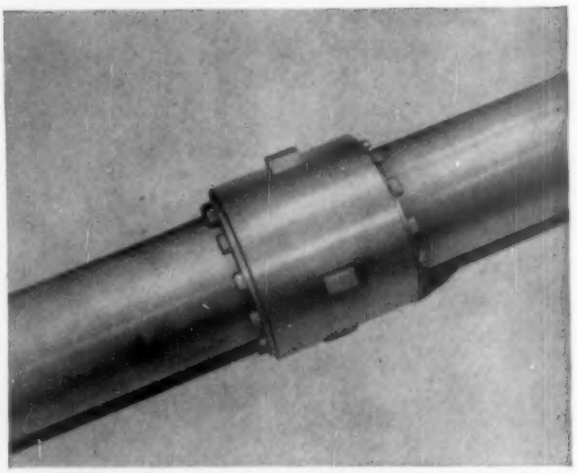
A VASTLY superior aluminum pipe and quick-connecting coupler system for the petroleum industry has been perfected by Kaiser Aluminum and leading fitting manufacturers.

This new system provides remarkable savings in temporary line costs because it permits a speed and ease of installation never before possible—thanks to aluminum's light weight and newly-designed detachable couplers.

The figures given below indicate the savings that are possible on drill rig supply lines using new Kaiser Aluminum pipe and couplers. Figures were compiled from extensive test installations by Kaiser Aluminum in Texas.

The light weight of Kaiser Aluminum pipe was the main factor in the savings for loading, stringing and pick-up. One man can easily carry a 30-foot length of four-inch aluminum pipe because it weighs only 31 pounds—compared to a back-breaking 323 pounds for equivalent steel pipe.

The new detachable couplers which can be engaged and disengaged in seconds were the main factor in the savings for connecting and disconnecting.



COUPLER made by Warren Manufacturing Co., 11 Hamburg Turnpike, Riverdale, N. J.

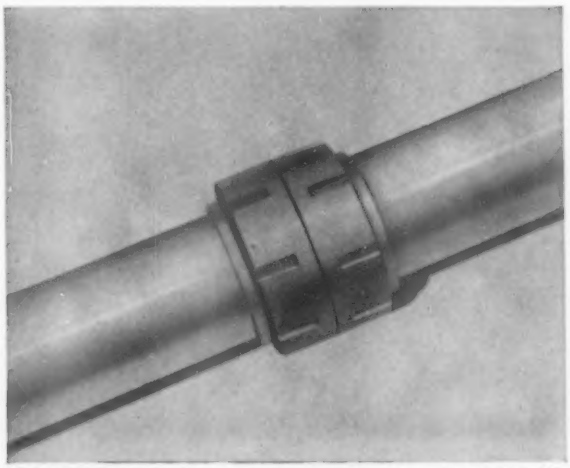
New Coupler Designs

Three new quick-connecting couplers are shown here, each made by a different manufacturer. Kaiser Alumi-

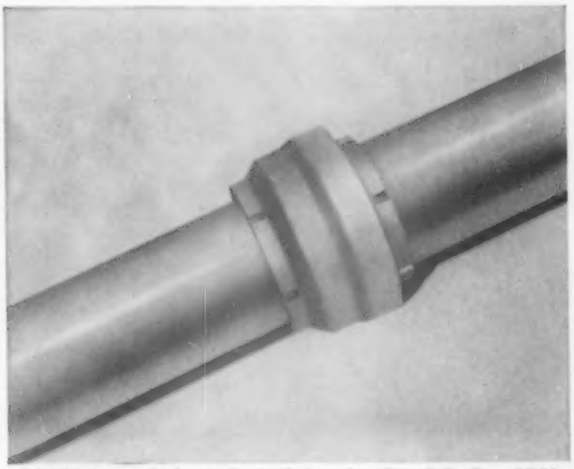
LAYING ONE MILE OF 4-INCH OIL RIG SUPPLY PIPE: Aluminum vs. Steel

	STEEL		ALUMINUM	
OPERATION	MAN HOURS	COST	MAN HOURS	COST
Loading	10.66 @ $2.20	$ 23.46	3.25 @ $2.20	$ 7.15
Stringing (Trucker)	1.66 @ $1.82	3.03	.83 @ $1.82	1.52
(Crew)	3.33 @ $2.20	7.33	1.66 @ $2.20	3.65
		$ 10.36		$ 5.17
Connecting	43.33 @ $2.20	$ 95.33	3.00 @ $2.20	$ 6.60
Disconnecting	26.25 @ $2.20	$ 57.75	5.00 @ $2.20	$11.00
Pick-up and reloading (Trucker)	7.25 @ $1.82	13.20	1.33 @ $1.82	2.42
(Crew)	29.00 @ $2.20	63.80	5.33 @ $2.20	11.73
		$ 77.00		$14.15
Total	121.48	$263.90	20.40	$44.07

Total savings with Kaiser Aluminum pipe—$219.83!



COUPLER made by Gateway Engineering Co., 3233 W. Grand Avenue, Chicago 51, Ill.



COUPLER made by Industrial Coupler Co., P.O. Box 1751, 4218 Boone Ave., Spokane, Wash.

num worked closely with these manufacturers in the design of the couplers.

They are all cast aluminum and require no welding. Instead, they are designed to engage the flared or flanged ends of the aluminum pipe sections with O-ring or molded type neoprene gaskets, seated in the coupler bodies by means of threaded locking nuts.

The locking nuts require only hand pressure with 6" spanner wrenches to guarantee leakproof connections at liquid or gas pressures from 0 to 1,000 psi.

The couplers provide highly flexible connections, permitting pipe to be laid around obstacles and over rough country without special equipment.

Flanging of the pipe can be accomplished either by power machinery in a shop or by hand tools in the field. This field flanging, plus the fact that no welding is required, permits quick and easy manifolding simply by cutting the tube to the desired length, slipping coupler over the tube, flaring the end and connecting.

Kaiser Aluminum petroleum pipe is roll-formed and induction welded from high-strength aluminum alloy sheet. It is available now in 30-foot lengths of 2, 3, and 4 inches diameter. Outside and inside surfaces are clad with high-purity aluminum to increase resistance to corrosion.

The pipe has a design pressure of above 1500 psi, with a guaranteed test pressure of 1000 psi, and a recommended operating pressure of 500 psi, providing a nominal safety factor of 3 to 1.

New Kaiser Aluminum petroleum pipe and the detachable couplers are available from your nearby supplier.

For more information, contact the Kaiser Aluminum sales office listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

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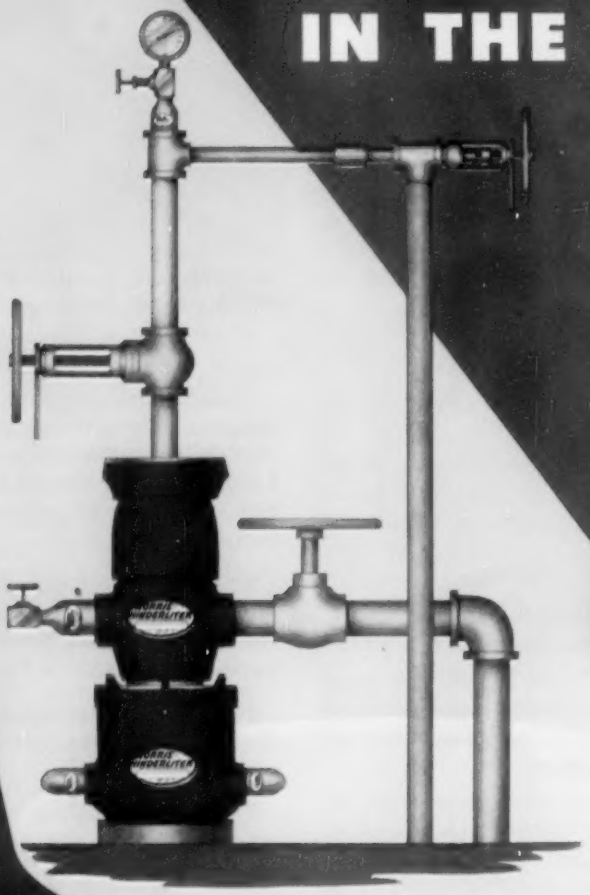

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

How We Determine Prices

WE still are occasionally asked, "How do you arrive at the prices you publish for refined products?"

The query may come from outside the oil business and when it does there is often the implication that something is rotten, not in Denmark, but in Oklahoma.

Through the years in answering the question, we have appeared before judges and juries, federal and state investigators, the Federal Trade Commission, and other organizations and individuals. So far as we know our explanations have always been accepted as satisfactory.

Our answer is and always has been that our market reporters are instructed to obtain the prices by contacting representative buyers and sellers. The quotations we publish are those which we believe to be the price or the price range at which the bulk of the product is moving on the spot market on the date indicated.

Subsequent information may reveal that our quotation was a little high or a little low but in all cases the quotations are ours, not somebody else's.

Eggs vs. Gasoline

Once we explained our market quotation procedure to a grand jury in Wisconsin. One of the farmer members, obviously certain that our pricing was rigged, tried to foul (not fowl) us up by making comparison between a gallon of gasoline and a dozen eggs.

We told him there was no essential difference between the two marketwise. A dozen eggs must have a buyer and seller and when they agree on a price there is a sale. If made known it is a factor in the published quotations used in that thriving branch of agriculture.

Incidentally had the atmosphere been less tense we might have explained that there was one noteworthy difference between his product and those that we quoted. Oil marketing has no counterpart for the occasional rotten or unhatched but thoroughly dead chicken egg which has caused our family to avoid the farmer-operated roadside egg stands.

There were several hours of this in which the jury, aided by local and Washington prosecutors, went over the Journal from stem to stern seeking evidence that we were part of a gigantic oil-marketing conspiracy which they were determined to find. We left the jury room at the day's end with the definite feeling that someone had laid an egg and we hoped it was not us.

But weeks later when the grand jury finally reported, they ignored us as having had any part in their findings.

Now we have those who profess to be concerned with the fact that buyers, under certain conditions, purchase under our published prices. We don't have the space here to go into the details of how this comes about, but they are as simple and understandable as our basic price schedule.

Principal Beneficiary

These marketing practices usually revolve around the operation of product pipelines. Starting 25 years ago lines were built north out of the Mid-Continent in order for refiners to benefit from lower delivered costs to major consuming points.

The pioneers in this field absorbed all of the transportation advantages and benefited substantially. They deserved to because they were taking financial and other risks which had no appeal to most of the industry at that time.

But now the movement of products by pipeline has become widespread and routine. There are government regulations including ceilings on distributed earnings.

The same base refining areas are used in our quotations and they accurately reflect what they are supposed to reflect. But distant sellers using pipeline for transportation are more and more inclined to give the buyers part or all of their transportation advantage. That is their business, not ours, and there are no secrets in refining and marketing circles about what they are doing.

As a case in point sellers may be taking delivery of their products at Des Moines or some other Middle West pipeline terminal. They still use the long-established Oklahoma (Group 3) quotation as the base but sell at whatever price is necessary to get the business.

All the concessions reflect is that the sale of petroleum products is highly competitive. Which leads to our final observation in this matter of pricing, which is that not only in the case of product lines but in every major development that has taken place within the oil business the consumer is ultimately the principal beneficiary.

today's most complete *advanced design*

- **863 Models** in three Basic Pressure Groups.
- **Capacities** from 2 cc. per hour to 15,000 gal. per hour.
- **Pressures** to 50,000 psi.
- **Mediums Handled.** Any liquid that will flow to the Pump—clear free-flowing, viscous, tarry materials and slurries—corrosive mediums such as acids, alkalies, salts, oxidizing and reducing agents, etc.
- **Capacity Control**—manual or automatic for proportioning in relation to temperature, time, flow, pH value, liquid level, pressure, color, conductivity or any other meterable factor.
- **Metering Accuracy** to two-tenths of one percent with automatic control mechanisms.

Now, no matter what your chemical proportioning problem—you will find the answer at PHILADELPHIA PUMP, "headquarters" for the most complete line of Controlled Capacity Pumps.

Advanced Design Offers Savings In First Cost and Maintenance

Pump users actually wrote the specifications for PHILADELPHIA PUMPS. For their design is the result of an industry-wide survey of pump users' practical experience on "what is wrong with the proportioning pumps you are using."

Simplification and standardization of basic features, and more efficient production methods, have answered the first complaint—High First Cost. Model for model, PHILADELPHIA PUMPS are lower in price.

Prevalent points of failure—cross-heads, connecting rod bearings, pressed valve seats, packing, etc.—have been corrected through advanced design and better materials of construction.

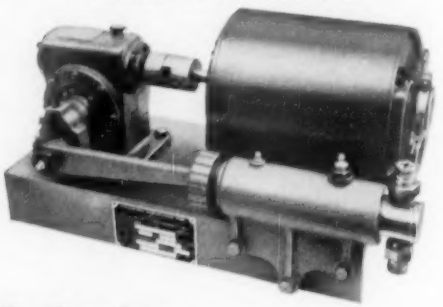
High Maintenance Costs—excessive down time and labor—have been eliminated by a design which permits the removal of all moving parts and packing through the oversize cross-head without breaking piping connections.

Proved by Years of Service In Leading Plants

Repeat orders testify to user satisfaction, and it is significant that engineers who know pumps best, men who purchase quantities of them annually for some of the largest plants—prefer PHILADELPHIA PUMPS.

It will pay you to investigate. Write for catalog.

Pressures to **800** psi



LP Series

The Phila-Feeder controlled capacity Proportioning Pump—a low cost, high quality pump popular for feeding water treating chemicals into steam boilers. Made in simplex and duplex types for maximum capacity to 18 gph. Adaptable to manual or automatic control.

Packaged Chemical Feed Units

PHILADELPHIA PUMP offers many standard and special designs of self-contained Units to meet all chemical feed requirements.

Unit illustrated is for feeding water treating chemicals. It comprises welded steel storage tank, Phila-Feeder duplex pump and all necessary auxiliaries and piping ready to connect to chemical feed piping and electrical circuits.

Other special Chemical Feed Units developed by PHILADELPHIA PUMP include:

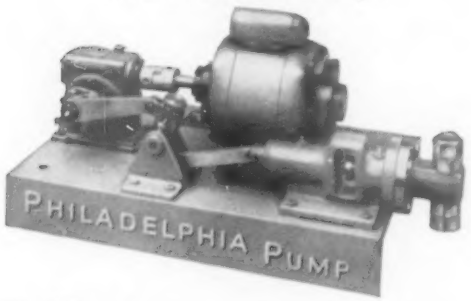
- Oil Well Chemical Treating Systems
- Natural Gas Odorizing Units
- Special Chemical Mixing & Proportioning Units

• *Sales Engineers in principal industrial centers in the United States, Canada, Mexico, and abroad.*

PHILADELPHIA

line of proportioning pumps

Pressures to **1500** psi

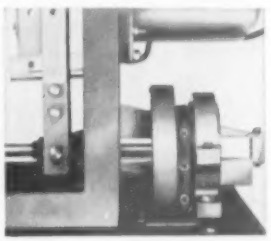


S Series

Made in simplex and duplex types for maximum capacity to 3300 gph. The standard proportioning pumps for most Processing Industry requirements and for treating of boiler water, municipal and industrial water, and sewage.

The pump illustrated is equipped with rocker-arm micro-adjustment of pump capacity while running.

The PHILATROL Automatic Control



This patented control mechanism for exceedingly accurate proportioning in relation to any meterable factor, adjusts piston stroke and hence pump capacity in response to manual, hydraulic, pneumatic or electrical motivation. It permits continuous stepless adjustment from zero to maximum and eliminates the "hunting" characteristics of other mechanisms with coarser adjustments.

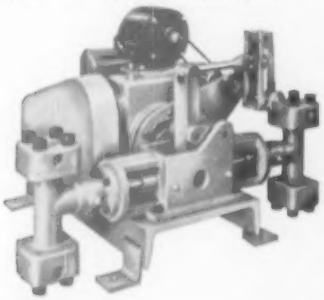
Illustrated is Philatrol Mechanism installed with air actuator on PHILADELPHIA PUMP used in gas odorizing. This pump has maintained metering accuracy within plus or minus two-tenths of one percent.

The UNI-FEEDER Automatic Control

Uni-Feeder single-revolution-clutch operated PHILADELPHIA PUMPS inject one or as many as 72 or more measured slugs of fluid per minute according to a time cycle or flow, color, concentration, or any other meterable factor.

Uni-Feeder Pumps are available with minimum capacities from .000093 gallons to maximum capacities of 27 gallons per minute.

Pressures to **50,000** psi



HP Series

These PHILADELPHIA PUMPS, designed for higher viscosities and pressures, are available in simplex, duplex and quadruplex types and in capacities from 2 cc. to 15,000 gph.

Like all PHILADELPHIA PUMPS, they are adaptable to both manual and automatic control of capacity.

The design of these pumps offers mechanical advantages which permit reduction in horsepower normally required by as much as 30 percent.

Differential Pressure Pumps

PHILADELPHIA PUMPS of the HP Series also offer a design feature which permits them to utilize the energy incorporated in any suction pressure to decrease the amount of horsepower required to produce the desired discharge pressure.

For example, if suction pressure is 2000 psi and discharge pressure is 3000 psi, the pump requires powering only for the differential pressure of 1000 psi, plus a small addition for friction losses. Consequently, great savings in first cost (motor, gear reducer, etc.) and operating cost can be effected.

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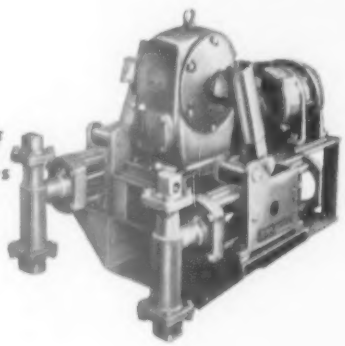

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. . . for many troublesome jobs

Thousands of BAKER CEMENT RETAINERS have been *successfully used* for placing cement, plastic, acid, or other fluids through tubing or drill pipe *at the place* where they will be *most effective*, behind the casing or liner; or *around the shoe*, or *into open hole* below the shoe. To be specific, Baker Cement Retainers are universally used for these important—and often troublesome—applications . . .

SQUEEZE JOBS, such as Reducing Gas/Oil Ratios, Cementing Behind Sections of Pipe, Plugging Off Bottom Fluids, Block Squeezing Prior to Perforating for Production —PLUGGING BACK TO UPPER ZONES—TESTING UPPER CASED FORMATIONS—CEMENTING LOW-PRESSURE ZONES—AND MANY OTHER USES.

BAKER CEMENT RETAINERS can be safely run in on tubing or drill pipe, and set by any experienced crew. After reaching the desired depth, a small Tripping Ball is dropped down the running-in string and pump pressure applied to build up the necessary hydraulic pressure to expand the packing element and set the slips. The resilient rubber packing element, which is prevented from flowing by lead rings, ensures a positive pack-off. Opposed slips prevent movement of the Retainer in either direction after it is set. Once set, the Retainer will remain in position and provide a leak-proof pack-off against any pressure imposed upon it, that is safe for the casing.

Cast iron construction is recommended for *permanent* installations, or where harmful well fluids are present; Magnesium Alloy Retainers are available for *temporary* installations. Retainers constructed of either material drill up quickly and easily because of the minimum material to be disposed of, and because both the Body and Slips are designed to break up and drill out readily.

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Exactly right for your wells

Consult the Baker representative in your area. Ask him to explain the advantages of the back-pressure valve; also how the Retainer can be converted into a casing bridge plug. And be sure to ask him why so many experienced operators depend upon the Baker Cement Retainer as their ONE BEST BET for a wide range of vital applications.

BAKER

"The Old Reliable"

CEMENT RETAINER

Are drilling contractors being penalized for progress?

IN THE BIGGEST YEAR of its history in wells and footage, the drilling industry is limping—not in performance but in adequate returns for what it is doing.

So far as accomplishments are concerned, as revealed in this special issue, it has been another year of outstanding progress in equipment and operating methods.

In design the modern drilling rig takes second place to none in the amazing developments pertaining to heavy equipment. That fact was apparent from the interest manifested in four rigs which were a feature of the General Motors Powerama at Chicago.

Unfortunately it was not possible to bring from the tidelands to Chicago and the public one of the mammoth but movable drilling units, which has sufficient power to supply the requirements of a sizable factory.

Drilling contractors in this country have taken some 3,000 of the rigs, of various types and sizes, and established new records in performance. Largely through improvements in methods the contractors have drilled more wells and more footage per rig than ever before and the entire oil industry has benefited.

BUT FEW WILL CHALLENGE the statement that net returns to the contractors are now generally inadequate. Their very efficiency has idled a sizable number of rigs. This in turn has tended to accentuate the competition that prevails for new drilling contracts.

It is charged that some large and small producers have taken advantage of this situation to force drilling rates down to unreasonable and unprofitable levels.

Regarding this we have the conviction that a dual responsibility exists.

Operators in the long run will lose, not gain, by fostering a competitive situation which does not adequately reward those who drill and complete their wells. The oil business has had many examples of that economic fact in its own operations.

THE DRILLING CONTRACTORS, through research and through sound engineering and business practices, have played a major role in the successful search for and development of producing properties in this and other oil countries. These responsibilities of the driller are certain to expand in the future, but they must have the incentive of profit.

Our second thought is that these are days when oil and other businesses find it necessary to reduce costs wherever possible. But sellers who survive don't let themselves get caught in this labyrinth of the American system of free enterprise, with unprofitable activities.

There are buyers' markets and sellers' markets in goods and services but basic controls always rest with the sellers. Let the contractors keep this in mind when they bid on their next contracts.

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THIS WEEK . . . . . IN THE NEWS

Refining

• Indiana Standard has resumed partial production at its 220,000-bbl. Whiting refinery less than a month after a disastrous August 27 fire and explosion. A crude run of 100,000 bbl. daily is being used initially. It will be boosted to 150,000 bbl. daily by mid-October. The company plans to build an Ultraformer to replace part of the capacity lost in the fire.

• Ashland Oil & Refining Co. is the latest oil company to enter the petrochemical field. Ashland will convert its entire 11,000-bbl. Louisville refinery to producing basic chemicals from petroleum. Louisville was selected because Ashland couldn't expand its refining facilities there and because the city is an important chemical center. Ashland also will enlarge its other plants in an $8 million modernization program.

Production

• Cooperation of crude buyers in taking distress oil caused by shutdown of Indiana Standard's fire-wracked Whiting refinery has averted a crisis in several Mid-Continent and southwestern oil producing states. Other firms bought at least 4,000,000 bbl. of oil usually taken for the Whiting plant. This allowed Texas authorities to increase that state's October allowable and New Mexico and Oklahoma to hold theirs at the September figure.

Drilling

• Foreign drilling is at an all-time high. There were 746 rigs making hole this month in non-Communist foreign countries. The total for all the non-Communist world is 3,680. The over-all figure is 221 more rigs than were running 18 months earlier. South America is setting the foreign pace. The prospect is for exploration and development to increase still further as petroleum laws are liberalized and new concessions granted.

Imports

• Eyes of the oil industry are being focused on Mobilization Director Arthur S. Flemming, who now has replies from big importers on their plans for voluntary controls. He must decide if the Government should step in to regulate the flow of foreign crude to protect the defense potential of the domestic industry. First question of oil men: If Government controls are ordered, will they be rigid quotas which will freeze out new importing firms? Other questions: Will the West Coast be treated separately? What about special products, Canadian oil? The Texas Railroad Commission now estimates that 1955 imports will average 1,123,100 bbl. daily, a gain of 13.97 per cent over 1954 figures.

• An indication of the impact of Canadian oil on U. S. markets is given with statistics on July imports. Oil from Canada averaged a record 43,300 bbl. daily compared with the previous June record of 36,000 bbl. daily.

• Union Oil President Taylor predicts that Canadian imports will meet the expected future increase in West Coast petroleum demand.

Natural Gas

• A 40.6 per cent increase in the residential requirements for natural gas is expected by 1958. Commercial requirements will gain 32.9 per cent over 1954. Industrial demand will show a 25.1 per cent rise. At least 26 per cent of peak-day withdrawals will come from underground storage which also will show a 78 per cent growth. This tremendous growth picture of the natural-gas industry comes from a survey just completed by the American Gas Association.

• A Federal Power Commission examiner has ruled out the escape clause in natural-gas supply contracts. The full commission still has to rule on this important device used by producers to hedge against later federal control.

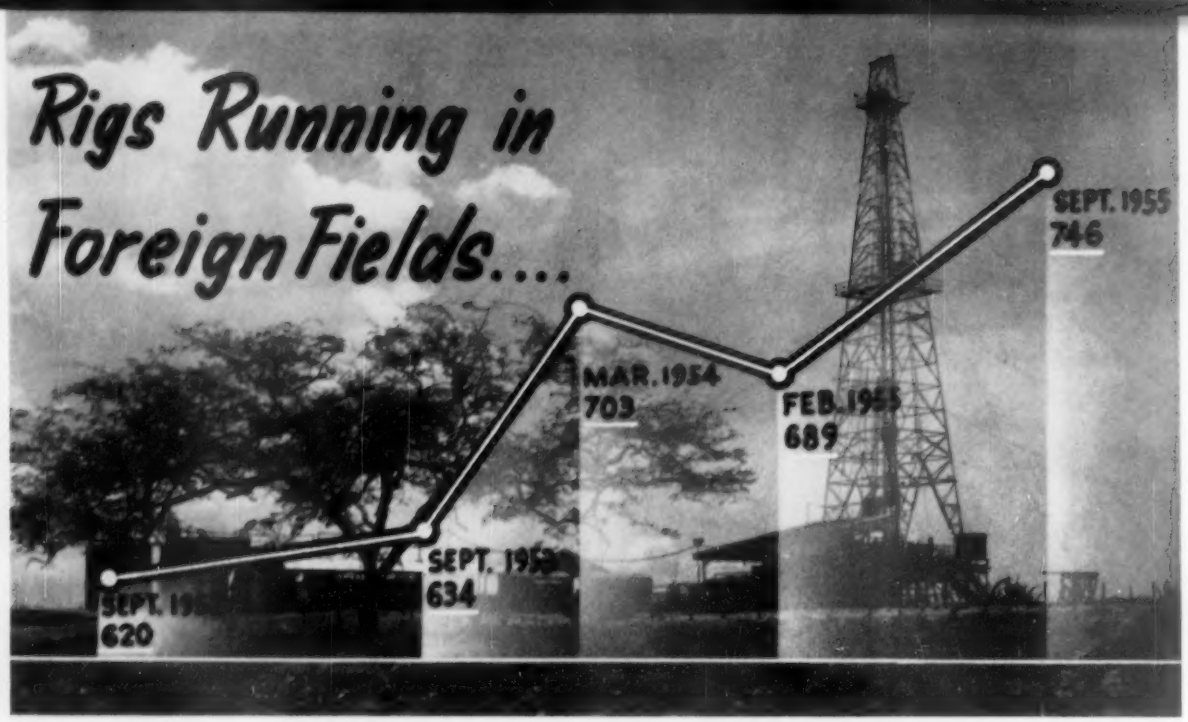
International

• The fall of Peron has apparently killed all hope for foreign exploration and development of Argentina's oil resources for the foreseeable future. The forces which overthrew the erstwhile Argentine strong man are known to be ultranationalistic. Some of his fiercest opposition was to his plans to permit major foreign companies to come in and try to find sufficient oil to fill the country's growing needs—a task at which the government monopoly failed miserably.

• Italy's government-controlled company has apparently made its first oil strike outside the Po Valley, the government's exclusive domain.

Exploration

• Geologists now believe the Mississippian and Jurassic formations will become extremely important producing zones in western Canada. One expert points to recent discoveries in the foothills regions of Alberta and British Columbia as bearing this out. He adds that the two formations in the next 20 years may prove up as much oil as the Cardium formation and the Devonian group.



Drilling Contractors Go Foreign

- **U. S. drillers are making hole in virtually every oil province in the non-Communist world**
- **American contractors are ready to expand, take bigger role in foreign-drilling scene**

AMERICAN drilling contractors have expanded their foreign operations to where they are operating in virtually every oil province in the world.

U. S. contractors have been drilling outside the U. S. and Canada for more than 25 years, but the big growth in their operations has been since World War II. These contractors are destined to play an even bigger role in foreign drilling as operators press their searches throughout the world.

Some of the biggest names in the contract-drilling business have rigs making hole overseas. This clan of foreign drillers is aggressive, fast-moving, and ready to take on jobs anywhere in the world. Most have expanded their operations within the past 5 years, and are ready for further expansion if the demand for their services increases.

While contract drilling has increased throughout the world, over-all rig activity also has been on the rise.

Currently, foreign drilling is at an all-time high. All signs indicate the foreign drilling will continue to hit new records as foreign operators continue their programs.

Early in September, 746 rigs were making hole in non-Communist foreign countries. This is a jump of more than 40 rigs over 18 months ago.

In addition to these foreign operations, an estimated 2,721 rigs were running in the United States and 213 in western Canada. This places the number of rigs running in the non-Communist world at 3,680 in early September. This is 221 more than the 3,459 rigs running 18 months earlier.

This increase in world-wide drilling also indicates foreign development and exploration is setting a new record. The biggest drilling gains have been scored in South America, primarily Venezuela and Brazil.

The rig total is almost certain to grow under present conditions as new concessions are explored and older fields developed. But two things could happen that would see the rig total take an even bigger jump: Adoption of more friendly petroleum laws in some countries and granting new concessions. Venezuela is one place being watched closely as far as new concessions are concerned. One big Latin American contractor estimated 25 new rigs would be needed in Venezuela once new concessions are granted.

The future . . . Several spots look good for the drilling contractor hunting work.

As one contractor put it: "Any place they find oil will help us." But some spots look better than others.

Venezuela, which might be called the "West Texas of foreign drilling," holds the top spot as the best place for the drilling contractor. Even if new concessions are never granted, there is still a lot of exploratory and development work in Venezuela.

Too, Venezuela holds some other advantages for the contractor. Venezuela has a better highway and road network that many foreign countries, which eases the problem of transportation. Also, drilling crews are available in most of the country.

The number of contract rigs running in Venezuela makes it apparent that the country is attractive to the contractor. Slightly over one-third of the 120 rigs running early in September were on contract jobs. There were 44 contractor's rigs at work, and contractors' crews were working on three company-owned rigs under a labor-contract arrangement.

There are 11 contractors with 69 rigs in Venezuela. Both the number of contractors and rigs is expected to grow. The operating companies encourage contractors to move into Venezuela, figuring they will get lower bids if more contractors are competing for the work.

One veteran Venezuela contractor said the drillers are gaining in their fight to convince operators that it is cheaper for the company to contract drilling rather than operate with company rigs and crews. The contractors

hammer away at the high costs of keeping equipment in the field, the overhead costs of keeping crews on the payroll, and the loss incurred when a rig isn't working.

"If we do the work," the contractor says, "they don't have these worries. And when we finish a job, they can cut us off without losing money on a rig stacked and a crew on the payroll without work."

The contractor's campaign apparently is gaining some ground since several of the company rigs have been sold to contractors in recent months.

Three of the four big international drilling-contracting firms are in Venezuela. The biggest operator in the country is Loffland Bros. Co. of Venezuela, a subsidiary of Loffland Bros. Co., Tulsa. Delta Drilling Co., Tyler, Tex., and Santa Fe Drilling Co., Los Angeles, also are big Venezuelan operators. The fourth big international drilling firm, Drilling & Exploration Co., Inc., Los Angeles, was organized in 1929 primarily for drilling in Venezuela, but has no rigs in the country.

Following is a rundown of the contractors in Venezuela, the number of rigs available, those operating and for whom:

... **Loffland Brothers,** 21 rigs, 16 operating: 4 for Mene Grande; 1 for Texas Petroleum; 4 for Richmond; 2 for Sinclair; 1 for Phillips; and 4 for S.A.P.I.M. (Soc. Anonima Petrolera Las Mercedes).

In addition, Loffland Brothers has one labor contract with Mene Grande and one with Shell.

... **Delta,** 13 rigs, 4 operating: 2 for Mene Grande; 1 for Richmond; and 1 for Creole.

... **Brown & Johnson,** one rig, one operating: one for Mene Grande.

... **Santa Fe,** eight rigs, six operating: five for Texas Petroleum and one for Richmond.

... **P.Y.S.** (Perforaciones y Servicios), eight rigs, five operating: two for Sinclair; one for Phillips; one for Atlantic; and one for Creole.

... **STOCA,** five rigs, five operating: three for Pantepec; one for Sinclair; and one for Phillips.

... **Dodson & Doerstadt,** four rigs, two operating; two for Mene Grande. Dodson & Doerstadt also has a labor contract with Shell.

... **Anaco Well Service,** two rigs, three operating: two for Mene Grande and one for Shell. Anaco is using a rig rented from Transportacion Industrial Petroleras on its Shell contract.

... **Transportacion Industrial Petroleras,** three rigs, none operating.

... **International Drillers,** two rigs, two operating: one for Mene Grande and one for Creole.

Rotary Rigs Running Outside the U.S. and Canada

(Excluding Communist-Controlled Areas)

Country—	Sept. 1955	Feb. 1955	March 1954
North America:			
Alaska	5	3	0
Costa Rica	1	1	0
Cuba	6	6	1
Mexico	76	75	82
Total	88	85	83
South America:			
Argentina	48	48	45
Barbados	0	0	1
Bolivia	4	7	6
Brazil	28	9	8
Chile	5	5	5
Colombia	21	19	23
Ecuador	10	7	9
Peru	21	18	22
Trinidad	30	28	27
Uruguay	1	0	0
Venezuela	120	104	110
(Eastern and Cent.)	(69)	(53)	(64)
(Western)	(51)	(51)	(44)
Total	288	245	256
Western Europe:			
British Isles	6	6	6
France	26	26	25
Western Germany	106	127	140
Italy	40	30	30
Netherlands	8	6	6
Portugal	2	2	2
Spain	3	3	2
Total	191	200	211
Africa—			
Algeria	9	9	9
Egypt	7	5	3
Angola	1	1	1
Ethiopia	1	1	0
Madagascar	1	1	1
Fr. Equatorial Africa	3	3	3
French Morocco	9	9	9
Nigeria	6	6	4
Tunisia	8	6	8
Mozambique	1	1	1
Total	46	42	39
Middle East and Eastern Mediterranean:			
Bahrain	1	1	2
Greece	2	1	1
Iran	1	4	1
Iraq	13	12	13
Israel	4	4	1
Kuwait	3	5	3
Neutral Zone	2	3	2
Trucial Coast	1	1	1
Qatar	2	3	2
Saudi Arabia	4	4	7
Turkey	5	5	2
Total	38	43	35
Other Asia:			
Australia	11	9	4
Burma	2	2	2
Indonesia and British Borneo	46	32	42
India	11	6	6
Pakistan	5	5	5
Japan	15	15	15
New Guinea	4	4	4
New Caledonia	1	1	1
Total	95	74	79
GRAND TOTAL	746	689	703

... **Bill Morgan,** two rigs, none operating.

Geographically, Australia and Peru are attractive. But a series of dry holes in Peru's Sechura Desert and the lack of a good strike in Australia have taken the bloom off hopes of a big drilling spree in these two countries. Despite these setbacks, rig activity has increased in both spots in the past 18 months. There are now 21 rigs in Peru, an increase of 3, and 11 in Australia, which is 2 more than 18 months ago.

Argentina is another Latin American country that might hold some hopes for the contractor. However, the fate of this prospect is clouded by Argentina's unstable political conditions.

Cuba may also develop into a hot spot. There are only six rigs currently operating in Cuba. But this number will increase once Stanolind Oil & Gas Co., Siboney Development Corp., Pacific Petroleums, Ltd., and some of the other bigger operators get their programs under way.

Europe holds limited possibilities for the American contract driller since some of the countries have laws unattractive to U. S. firms. However, one American contractor, Drilexco, has landed contracts in France, Italy, and Sicily. The same holds true for Brazil. Again, Drilexco is the big—and in Brazil's case, the only—contractor.

Drilexco has acquired the reputation of winning contracts in government-controlled oil industries where others have failed.

While there are scores of drilling contractors throughout the world, one is likely to run into the four big American firms—Drilexco, Loffland, Santa Fe, and Delta—if you try to land a foreign contract. These four firms have about 100 rigs in foreign countries.

Loffland . . . In addition to being the biggest contractor in the U. S., Loffland also has a king-sized foreign operation. Currently, it is concentrating on Venezuela, where it has 21 rigs. But the company has either equipment or crews in three other countries.

It is drilling a wildcat in Costa Rica for Union Oil Co. and has labor contracts in Colombia and Australia.

Loffland's foreign operations are directed by John O. Rundle, a company vice president and veteran of foreign operations. Rundle has spent most of the past 12 years directing Loffland activities in Canada, Peru, Cuba, and Venezuela. He returned to Tulsa from Venezuela early this year. Now heading the Venezuelan operations is William

AN AMERICAN CONTRACTOR, Drilling & Exploration Co., Inc., is drilling this rank wildcat in Saudi Arabia in the province of Dhofar for Cities Service Co. and Richfield Oil Corp. (Cities Service Co. photo).

Odgen, who headquarters at Maracaibo.

The company's first move outside the U. S. was in 1942 when it started operating in Nova Scotia. Loffland moved to Venezuela about 4 years later and has continued to expand its Venezuelan operations. R. W. Wire has headed the company during most of the postwar expansion.

Drilexco . . . The most widely scattered drilling program of any contractor is conducted by Drilexco. The company and its affiliate had rigs running in eight countries in early September.

Work is being carried out under the Drilexco name in Iran, Saudi Arabia, and Brazil. A Holland company owned 51 per cent by Drilexco, Nederlandse Boormaatschappij, N V. (Drilvo), has rigs at work in Holland, France, Italy, Sicily, and Nigeria.

The company was organized by two of the best-known figures in the drilling industry, J. E. Brantly and C. R. Rider. Brantly headed the company from 1929 until his retirement in 1952. He was a prime mover in formation of the American Association of Oilwell Drilling Contractors and was its first president. Rider is now chairman of the board and R. L. Rose president.

Drilexco has been connected with Brazilian oil operations for more than 15 years—since oil was discovered in the Bahia area in 1939. Until late last year, it worked for Conselho Nacional de Petroleo. Formation of the new national oil company, Petroleo Basileiro, S.A. (Petrobras), led to the signing of a new 2-year contract.

As a result of a high-gravity discovery this spring near Nova Olinda in the upper Amazon area, Drilexco has recently increased its American personnel in Brazil from 29 to 69. The newcomers will work on eight new rigs Petrobras will use in evaluating and developing the 9,000-ft. discovery.

Drilexco's Brazilian operations are headed by Ned Brantly, Jr., from Rio de Janeiro.

In the Middle East, Drilexco crews are drilling an exploratory test in Dhofar for Cities Service Oil Co. and Richfield Oil Corp. In Iran, the firm is preparing to start a new contract with National Iranian Oil Co. First well will be drilled near Teheran.

Drilvo, the Holland affiliate, has two rigs working for Royal Dutch-Shell interests in Holland. During the past 2 years, the rigs have drilled more than 70 wells with a total footage in excess of 207,500 ft.

In the Aquitaine Basin near Bordeaux, France, a Drilvo rig is working for Esso Standard, S.A.F.

Another rig is working on the east coast of Italy, near Pescara and across the peninsula from Rome. Earlier this year, Drilvo drilled a discovery near Pescara for Petrosud, owned jointly by Gulf Oil Corp. and an Italian firm. The well flowed 2,000 bbl. daily of 34°-gravity crude. In eastern Sicily, the company has two rigs drilling for Augusta Ricerche Petrolifere, S.P.A., a Standard Oil Co. (N. J.) subsidiary.

Drilvo also has a rig working in Nigeria, West Africa, for Shell D'Arcy Petroleum Development Co. The rig is now on its fifth location, 90 miles northwest of Port Harcourt.

Delta . . . The growth of Delta Drilling in postwar years is an indication of how the American drilling contractor is pushing his business outside the U.S. and Canada.

Delta first ventured out of the U.S. in 1942 when it drilled two wildcats in Nova Scotia for Lion Oil Co. But it wasn't until 1952 that it made its first step outside North America—and the company has closed three deals in the last year that shows it has more and bigger plans for foreign work.

Like Loffland Brothers, Delta has its biggest concentration of rigs in Venezuela. The Tyler company entered Venezuela in April 1954, when it acquired Perforaciones Guarico, C.A., which operated seven rigs. This operation works out of Caracas.

Within the past year, Delta has purchased another Venezuelan drilling firm, Maracaibo Towing Co., and two rigs from Richmond Exploration Co. The sales increased the company's number of rigs in Venezuela to 13.

Delta also is shaping up an operation in Italy that will be capable of handling drilling anywhere in the Mediterranean area. Last August, it bought Cia. Industrie Metanifere e Affini, an Italian company that has been drilling 5 years in Italy and Sicily. The sale included one rig.

The company plans to "increase substantially" the equipment in Italy in order to expand the subsidiary's program. The subsidiary headquarters in Bologna, Italy.

Delta also is working in Spain. The company, along with a group of other American firms, started an exploration program for the Spanish Government in 1952. Delta shipped a rig to Spain, then later turned it over to the government and continued under a labor-contract arrangement. A second rig is being shipped from Houston for use in the Spanish drilling program.

Santa Fe . . . Most of Santa Fe Drilling's operations are in Latin America,

but the company also has crews in the Middle East and Australia. The company has 24 strings of tools at work outside of the U. S. More than half of the tools are owned by the company and its subsidiaries.

From company headquarters in Santa Fe Springs, on the eastern outskirts of Los Angeles, drilling activities are guided for rigs in Venezuela, Peru, Chile, Trinidad, British Honduras, Australia, Bahrain, and the Neutral Zone.

The company has set up three subsidiaries for its foreign work, Santa Fe of Venezuela, Santa Fe of South America, and Santa Fe Overseas.

Santa Fe is a company owned by employes and former employes. J. D. Robinson is president of the firm.

Other contractors . . . In addition to these four big operators, several other U. S. contractors have foreign operations on a smaller scale.

Brown Drilling Co., Long Beach, has a three-rig foreign operation. Two rigs are in Australia and one in Trinidad. Only one of Brown's Australian rigs is running.

The company played a role in the 1 Rough Range strike that touched off the Australian play in December 1953. Brown Drilling was contractor for the discovery well, which was drilled to 14,000 ft. It drilled the well for Western Australian Petroleum, Ltd.

Another U. S. contractor active in the Australian play is Lucky Strike Drilling Co., Tulsa. Lucky Strike is 20 per cent owner of Oil Drilling & Exploration, Ltd., a contract-drilling firm set up in Australia. The company has four rigs in Australia.

Kerr-McGee Oil Industries, Inc., Oklahoma City, also is busy in foreign drilling. The company has a rig drilling development wells in Cuba's Jatibonico field. Kermac was contractor on the 1 Echevarria well that touched off the present Cuban play in May 1954.

A Kermac crew returned in February from Israel, where it drilled a well in the Negeb area of Judea for Lapidoth-Israel Petroleum Co. The company also has drilled for Phillips Petroleum Co. in Alaska, American Independent Oil Co. in the Neutral Zone, and Mexican American Independent Co. in Mexico.

Other contractors who have rigs running in Cuba include Dixie Drilling Co., Houston; Ted Jones, Los Angeles; C. J. Simpson Drilling Co.; and Texon Drilling Co.

Another California contractor who entered the foreign drilling scene last June is Thomas P. Pike Drilling Co., Los Angeles. Pike took over the rig and contract which Dunlap & Graham held in Uruguay. Pike is scheduled to drill six wells for the Uruguayan Government organization, ANCAP.

WATCHING WASHINGTON

Bertram F. Linz

Tax Write-Off Shift Seen

A new policy on allowing accelerated tax amortization on plant expansions in the oil industry may come from Mobilization Director Arthur S. Flemming this month.

Except for a few products—alkylate among them—the issuance of certificates for quick write-off of new investments in plant and equipment was suspended in August.

The suspension followed criticism in Congress of the way some expansion programs had worked out and the objections of the Treasury to further continuance of the tax concession on a broad scale.

The Treasury, which went along with the plan as a means of getting quick industrial expansion for the Korean war, told Congress it was time to cut it back. Secretary Humphrey said it was costing the Government $800,000,000 a year in revenue and prevented tax cuts.

Neither Congress nor the Treasury called for complete abandonment of the tax program. But Flemming has indicated it will be granted in the future only to plant expansions which fit the government's industrial security program.

The new policy is expected to make provisions for expansions in refining capacity. But it is doubtful that any and all expansions will be given quick write-off. The oil and gas industry has committed $4,400,000,000 under the amortization program, and it is believed that some types of refinery expansion already are close enough to the government-set target to justify their exclusion.

Oil Men Under Fire

A long list of congressional investigations will get under way well in advance of the next session of Congress.

The latest to be announced is a probe of Pentagon oil activities by the House judiciary committee, headed by Rep. Emanuel Celler of New York.

Celler will try to uncover any signs of industry influence on military petroleum matters. His study is expected to cover the office of petroleum logistics, the Armed Services Petroleum Purchasing Agency and the Military Petroleum Advisory Board.

This is the committee that is investigating the activities of industry men serving the Government without compensation (WOC's). That study was suspended when Congress adjourned for the summer but is due to resume next month.

Oil industry operations will be surveyed from another angle, also. Rep. Wright Patman, Texas, chairman of the House small business committee, will hold hearings beginning October 31 on operation and enforcement of the Robinson-Patman Act.

Patman is expected to make another probe of the Standard Oil Co. (Detroit) case, still unsettled after several years of effort on the part of the Federal Trade Commission.

Taste of Price Control

An indication of what independent natural-gas producers find themselves up against under federal price control came to light last week.

A Federal Power Commission examiner called on the Dorchester Corp. of Amarillo, Tex., to put up a surety bond in the sum of $742,000. The bond is to cover the approximate annual amount of a rate increase by Dorchester on sales from the Guymon-Hugoton field in Oklahoma to the Natural Gas Pipe Line Co. of America.

The producer's original contract with Natural called for a price of 6.253 cents per 1,000 cu. ft. Last October it filed a rate of 9.862 cents with the FPC under its Order 174-A in conformity with a 1952 minimum price ruling of the Oklahoma Corporation Commission. The FPC accepted the filing on a conditional basis pending a Supreme Court decision in Natural's attack on the validity of the minimum price order.

In December Dorchester asked another increase to 10 cents per 1,000 cu. ft. This was allowed to go into effect last March under a bond of $41,000.

When the Supreme Court invalidated the Oklahoma price order, Natural opposed the price increases proposed by Dorchester. It asked that the bond be increased to cover the difference between the old rate of 6.253 and the proposed rate of 10 cents.

The examiner's decision has been sent to the full commission, where it is subject to review. It may be appealed by Dorchester.

Distress Oil Absorbed

Other buyers take up slack caused by Whiting refinery fire; Texas hikes October allowable; other states hold the line

CRUDE-OIL buyers from other companies generally moved in last week to bolster the crude market crippled when the big Whiting refinery of Standard Oil Co. (Ind.) was shut down by an explosion and fire. Their action prevented a wholesale slash in state allowables for oil producers in the Mid-Continent and Southwest.

As a result, the Texas Railroad Commission was able to set an October allowable for that state of 3,148,459 bbl. daily, up 75,533 bbl. from the quota in effect on September 3.

Oklahoma kept its allowable the same for October, estimating a production of about 560,000 bbl. daily. This probably will be an increase of 5,000 bbl. over September due to new wells coming into production. Operators had asked for an increase in the allowable.

New Mexico also retained its same September allowable for October. The Kansas allowable was yet to be determined.

The states held the line on production despite a reduction of 153,650 bbl. daily in the take of Stanolind Oil Purchasing Co., which buys for its parent Indiana Standard and the big Whiting refinery.

Stanolind had cut its take in Texas by 60,000 bbl. daily, Oklahoma 17,650 bbl., New Mexico 21,000 bbl., Kansas 20,000 bbl., and the Rocky Mountain region 35,000 bbl.

Take distressed oil . . . In Texas, Oklahoma, and New Mexico, however, crude-buyers from other companies were taking over the distressed Stanolind crude.

After hearing assurances that the excess crude would be absorbed, the Texas Railroad Commission hiked the daily allowable there for October to 3,148,459 bbl. This was 127,373 bbl. daily over the figure initially set for September but 75,533 bbl. daily over the allowable in effect September 3.

Producing-day rate was fixed at 16 for the 31-day month.

A majority of the oil-buying companies favored the adopted 16-day rate. These included: Humble Oil & Refining Co., The Texas Co., Magnolia Petroleum Co., Sun Oil Co., Gulf Oil Corp., Phillips Petroleum Co., and Sinclair Crude Oil Co.

Shell Oil Co. favored 17 days; while Atlantic Refining Co., Cities Service Oil Co., Continental Oil Co., and Pan American Production Co. asked for 15.

Producers worried . . . Stanolind's announcement that it was forced to curtail its oil purchases in Texas to 55 per cent of normal volume caused great concern among producers.

Members of the Railroad Commission reported at the Austin allowable hearing that they had been deluged with telegrams, phone calls, and letters from producers protesting the loss of their "rightful share of the state market as a result of purchaser proration."

Producers showed up in force at the statewide hearing to press for relief.

Particularly concerned were those operators with water floods in North and West Central Texas who said they would have to suspend such operations with resulting physical waste of oil unless someone could be persuaded to take the oil usually bought by Stanolind.

The commission acted swiftly to see that all oil possible was taken. Commissioner Olin Culberson termed the situation an "industry problem and one which the major purchasers should exert every effort to solve."

TEXAS' OCTOBER ALLOWABLE

District—	October	Increase over Sept. 3
1—Southwest	68,052	1,528
2—Gulf Coast	150,707	5,182
3—Gulf Coast	457,549	10,890
4—Southwest	255,168	6,781
5—East Central	57,204	1,495
6—Outside E. Texas field	130,244	3,998
6—East Texas field	214,812	5,927
7-B—North Central Texas	194,198	5,945
7-C—West Central Texas	194,343	5,921
8—West Texas	1,002,987	19,290
9—North Texas	292,779	7,179
10—Panhandle	130,416	1,397
Total	3,148,459	75,533

Culberson noted that a similar situation in New Mexico was met when purchasers took proportionate shares of distress oil in that state.

Purchasers told the commission that they could take up to 65,000 bbl. of crude daily in areas where Stanolind is curtailing its runs if satisfactory arrangements could be made. Some, however, conditioned their offers to take only oil of specification suitable for their refining situations.

Delay suggested . . . W. J. Murray, Jr., chairman of the Texas commission, decided against following a suggestion made by Commissioner E. O. Thompson that the agency postpone setting the allowable until later.

Thompson suggested such a course so that the commission might have the benefit of replies to Defense Mobilizer Arthur Flemming's letters to importers asking their ideas for trimming imports.

Murray reasoned the commission could increase the allowable at any time if oil-import cuts should result from ODM action.

Refinery to open . . . The Oklahoma commission ruled it had no authority to force other purchasers to take the distress oil but noted that other purchasers are "cooperating wonderfully" to meet the problem.

R. L. Pielsticker, Tulsa, president of Stanolind Purchasing, informed the Oklahoma commission that the fire put the 220,000-bbl. Whiting plant out of business. He reported reconstruction was in progress.

He said, however, "it is going to take quite a lengthy time to get operations back to normal." Pielsticker added that other purchasers have bought nearly 4,000,000 bbl. of crude from Stanolind to help the stricken firm. He said he hoped the company would not have to prorate after October.

North Dakota cuts . . . Meanwhile the North Dakota Industrial Commission

Whiting Refinery Is Back on Stream

WHITING, Ind.—Standard Oil Co. (Ind.) went back on stream with its 220,000-bbl. refinery here last week less than 1 month after the big plant was closed by a fire August 27.

A. F. Endres, refinery manager, said 100,000 bbl. of crude daily are being run through the plant initially. More crude units will be placed on stream within the next 3 weeks, to boost the throughput to about 150,000 bbl. daily by October 15.

The company's five other Midwest refineries are continuing to operate at full capacity while the Whiting operations are restricted. The fire started after an explosion of a 30,000-bbl. fluid Hydroformer *(The Oil and Gas Journal, September 5, page 62)*.

Endres said limited crude running was resumed at Whiting September 9. He said every effort is being made to return the plant to full operations as soon as possible.

The company has announced an Ultraformer will be built to replace part of the capacity lost in the fire.

set that state's daily oil allowable at 21,835 bbl., a reduction of 12,815 bbl. daily from the September quota.

The reduction resulted from a lower demand of Stanolind Purchasing in North Dakota fields for the Mandan refinery which is undergoing a normal turnaround. Stanolind cut its nomination for North Dakota oil by 13,000 bbl. daily for the month.

Texas Oil Men Honored

DALLAS.—Two Texas oil men who came up through the ranks to attain prominence in the industry will receive the 1955 distinguished-service awards from the Texas Mid-Continent Oil and Gas Association.

J. Ed Warren, of New York and Midland, and Sam M. Gladney, Dallas, will be honored at the closing session of the association's annual meeting here October 3-4.

Warren, 55, who started as roustabout for Carter Oil Co. in 1923, is vice president of First National City Bank of New York and a partner in King, Warren & Dye, Midland oil producers. He has been president of the American Association of Oilwell Drilling Contractors, president of the Independent Petroleum Association of America, and deputy administrator, Petroleum Administration for Defense.

Gladney, 57, who joined Sun Oil Co. in 1919 as a clerk, has risen to general manager of the company's southwest producing division after holding positions in various departments *(See biographical sketch, page 355).*

Florida Tidelands Leased

TALLAHASSEE, Fla. — The California Co.'s plans for a long-range search for oil along Florida's Gulf Coast gained momentum last week.

The company obtained an oil-exploration lease on 734,760 acres lying under gulf waters off Monroe County on the southern coast of Florida. The 10-year lease was awarded by the Florida State Internal Improvement Board. Successful bid by The California Co. was $1,106,000 for the first year's lease.

Trustees of the Internal Improvement Fund of Florida meanwhile had approved an earlier agreement under which The California Co. will spend up to $10,000,000 exploring for oil in other sections of Florida's Gulf Coast *(The Oil and Gas Journal, August 22, page 101)*. This program was scheduled to start before October 1.

The earlier agreement, between Calco and Coastal Petroleum Co., covers approximately 4,500,000 acres. Most of this acreage is under gulf waters.

"Petroleum Day" Dignitaries

One of the features of General Motors' Powerama was "Petroleum Day." Among the guests during this portion of the big show were left to right, Secretary of Interior Douglas McKay, A. W. McKinney, president of National Supply Co., and N. C. Dezendorf, vice president of General Motors and general manager of the Electro-Motive Division. The trio is inspecting a diesel-electric rig supplied by National Supply. The rig was powered by two 875-hp. Electro-Motive power units and equipped to drill to 16,000 ft.

Industry Briefs

LOS ANGELES.—Within the next 2 months Richfield Oil Corp. will start moving into the new $2,500,000 research and development laboratories nearing completion near Anaheim, southeast of Los Angeles. About 100 engineers and chemists will be employed at the research center, comprised principally of five main buildings.

WILMINGTON, Del. — Units for turning out metallic sodium, tetraethyl lead intermediates, and solvents will be added to the Du Pont plant being built 2 miles east of Antioch, Calif. The new plant will use electricity, salt, and propane to produce sodium, ethyl chloride, trichlorethylene, and perchlorethylene. It will be designed and constructed by the Du Pont engineering department, which expects to complete the job early in 1957. The adjoining tetraethyl lead and Freon refrigerants plant is to be finished late next year.

WASHINGTON.—Central Kentucky Natural Gas Co., Charleston, W. Va., plans to build a 14.2-mile, 24-in. pipeline from Cold Springs to Anderson Ferry, Ky., including two river crossings of double 20-in. pipe. The company also will lay a 6.9-mile, 20-in. line from the Means compressor station to South Means, Ky., and install an additional 1,980-hp. at Means. The whole project, for which Federal Power Commission authority is being sought, would cost $2,474,100.

ALBANY, N. Y.—A new 250,000- bbl. asphalt terminal to serve a five-state market area will be built here by American Oil Co. The 20-acre terminal will handle asphalt deliveries by truck, tank car, and barge. It will receive products from Amoco and affiliated refineries in Texas City, Savannah and Baltimore.

HOUSTON.—Farnsworth & Chambers Co., Inc., has been awarded the contract to build a new polyethylene plant for Phillips Chemical Co., wholly owned subsidiary of Phillips Petroleum Co. Capacity of the plant, located at Adams Terminal on the Houston Ship Channel, will be 110,000,000 lb. per year. Raw material to turn out the versatile plastic, Marlex, will be piped through a 75-mile line from Phillips' ethylene plant now under construction at Sweeny, Tex.

SPRINGFIELD, Ill.—Gov. William G. Stratton, of Illinois, has extended his state's membership in the Interstate Oil Compact Commission for an additional 4-year period. Illinois was one of the five original members when the compact was organized in 1935.

Industry Awaiting Import Decision

- If Flemming orders controls, many fear rigid quota plan will keep out newcomers, give present importers monopoly
- Other baffling issues: Should West Coast get separate treatment? What about special products, Canadian oil?

Bertram F. Linz

WASHINGTON. — Mobilization Director Arthur S. Flemming, as a former school teacher, is used to complex questions. But none probably as baffling as those surrounding the battle over foreign oil imports.

Flemming last week began studying suggestions of oil importers on how they plan to restrict their shipments voluntarily to avoid government controls.

The first big question for Flemming, of course, is: Do these plans actually restrict imports sufficiently to protect the defense potential of the domestic oil industry?

If Flemming decides the Government should step in to umpire the competitive struggle between domestic and foreign oil, he will face a whole package of quizzers. Just a few:

. . . **Should imports be limited** to a fixed ratio of domestic production?

. . . **What about new firms** wanting to start importing? Should they be frozen out of the picture? Or should present importers be forced to reduce their quotas further to make room for the new oil?

. . . **Should the West Coast,** where imports are increasing at a fast pace, be treated separately from the East and Gulf Coast states?

. . . **Should special provision** be made for imports of products not produced in this country in adequate volume, such as asphalt and low-gravity crudes?

. . . **How should Canadian** oil be treated?

The probable answer is that no group, no area, and no product will get preferential treatment or be discriminated against.

Domestic producers and members of Congress who fought to have the amendment protecting defense industries written into the Reciprocal Trade Act will settle for nothing else.

Plans kept secret . . . Flemming has said repeatedly he prefers to have imports limited by the voluntary action of the industry. But last month, when he asked the 18 major importers to say what they planned to do about it, he found no prospect that they were moving to keep imports down to the formula recommended last February by the cabinet fuels committee.

As a result, Flemming told the companies that unless they came up with workable suggestions for voluntary control by last Wednesday the Government would have to take action. He was giving them this chance, he said, because he wanted to make certain that no voluntary solution is available before recommending that President Eisenhower step in.

So far, Flemming has not disclosed what plans the companies may have offered. But it is known that some maintained they were keeping their imports within the formula and had no suggestions to offer.

Place for newcomers . . . The big question in either voluntary or federal control is how the new and prospective importers will fit into the picture. Companies which have not engaged in importing in the past can't be barred from importing in the future. The problem is to fit them in.

Some of the major importers include in their figures foreign oil sold to others for importation. If all companies charged themselves with all imports of their oil, regardless of who brought it in, it would make control simplier. But some companies insist they are entitled to the share of imports for their own account that they had last year.

So far, Flemming has not indicated what he believes is the best solution. In fact, it is doubtful if he has arrived at any concrete conclusions. There will be another meeting of the cabinet committee in the near future for further talk about the matter. But there is no indication as yet that a round-table meeting of importers and domestic producers will be called, as suggested by the Texas Independent Producers and Royalty Owners Association.

Flemming has indicated that whatever is done by the Government will not put importers in a strait jacket. If controls are necessary, they will be so set up as to permit imports to fluctuate in step with domestic production.

On the basis of present figures presented by importers to the Texas Railroad Commission that would mean a cutback of approximately 59,000 bbl. daily in 1955 imports. But it is doubtful whether any program for limitation, either voluntary or Government, could accomplish a cut of anything like that this year.

Fears foreign repercussion . . . Except for the State Department, there is no longer any material dissent in the Government from the idea of import limitation. The State Department, of course, is concerned with the effect on our relations with the foreign producing countries. It would much prefer a voluntary program to the imposition of a quota. And it probably would view higher import taxes as less objectionable than quotas.

It is total imports that Flemming is concerned with. Administration officials point out the question is not one of conserving any particular share of the market for the established importers or of making special provision for newcomers. If only the older importers were cut back to the formula ratio, total imports still would be excessive, they point out.

Quota favored . . . There is no indication that the Government would consider splitting a quota among individual companies. And domestic producers would fight any import formula that would tend to freeze the situation. Practically without exception they see quotas as the only effective way of controlling imports if the companies themselves can't do it.

This was made clear by both Walter S. Hallanan, president of the Plymouth Oil Co. and chairman of the National Petroleum Council, and Russell B. Brown, general counsel of the Independent Petroleum Association of America.

The position of the large importers cannot be made a monopolistic one, Hallanan told The Oil and Gas Journal. They are subject to all the considerations that come with the development of foreign oil.

Most of the companies are trying to come within the formula, Hallanan said. Voluntary policing is not new, he pointed out. A provision in the Iranian consortium agrees that for every barrel of oil produced in Iran and brought into the market there will be a corresponding reduction in some other area.

Hallanan sees no basis for any special consideration for individual importers, areas, or products. "The minute we get into giving special consideration it will destroy the whole formula," he said.

"A fixed and necessarily arbitrary rule will squeeze somebody, but other-

wise there would be too many leaks in the tent."

Hallanan views a quota as the only effective action the Government can take. It means that the established importers will have to forget that they have carved out any specific part of the import market for themselves. He pointed out that if a new field is brought in in Texas, where Plymouth produces, allowables for his company and all other producers are modified to make room for the newcomer.

"We cannot hope to maintain the status quo," Hallanan declared. "We cannot make imports a monopoly."

Brown's views . . . Brown similarly called for an over-all quota. But he suggested that the situation might be met by imposition of a tariff, possibly $1 per barrel, on all imports, or a combination of a lower tariff plus some quota provision.

"But we have no interest whatever in how it is done, so long as it is flexible and imports are kept within reasonable limits," Brown emphasized.

Any quota imposed should be for calendar quarters and figured on the historical basis, corrected up or down as domestic demand changes, charging the companies with all they sell here directly or indirectly, Brown said.

To make limitations effective, he added, the big importers must step aside to make room for newcomers. This principle already is applied to domestic producers. When a new state comes into production the other states have to adjust to make room for it.

Importer speaks . . . One importer expressed apprehension that the Government might freeze imports of individual firms at a ratio to their 1954 level of imports.

K. S. Adams, chairman of Phillips Petroleum Co., at present a small importer, declared "such inflexibility would grant to only a few companies an exclusive right to import."

Adams explained this would work an extreme hardship on companies which have made foreign investments but are not yet in a position to recover on them. Their right to import would be denied under such a system because the domestic market would be reserved only for those firms importing in 1954, he pointed out.

He said "some provision for sharing permissible import volumes must be made."

The import problem is particularly acute on the West Coast. There, imports which averaged 59,000 bbl. daily in the first quarter are expected to reach 111,000 bbl. daily in the final 3 months of this year. A big factor is Shell's new refinery at Anacortes, Wash. Just starting operations with imports of around 6,000 bbl. daily from Canada, this plant will be taking 23,000 bbl. daily in the coming quarter.

ODM Director Flemming
. . . An educator with a big problem

A Government analysis of imports, based on reports to the Texas Railroad Commission and adjusted by actual and expected increases in domestic production as provided in the cabinet committee formula, shows that while excess imports are being reduced on the East Coast they are climbing steadily in the Pacific area.

The figures show this picture:

The East Coast excess over the formula was 55,000 bbl. daily in the first quarter this year. It will be reduced to 3,000 bbl. daily in the final quarter, and will average 26,000 bbl. daily for the year. On the West Coast the excess was 8,000 bbl. daily in the first quarter. It will be 55,000 bbl. daily in the next 3 months, and average 33,000 bbl. daily for the year. The quarterly totals are shown in the accompanying table.

If import limitations are applied equally to both coasts, they might open up new western markets in the future for producers in Texas and the Rocky Mountain area.

Marketers oppose . . . The importers are finding some support in the industry against government regulation. Some marketers for economic reasons want plenty of foreign oil available. They consider the cabinet committee formula unworkable and inequitable.

John H. White, chairman of the National Oil Jobbers Council, challenged Flemming's authority "to coerce or threaten" importers to the point of requiring voluntary restriction. "There is nothing in law giving him the right to take action which would result in restraint of trade and commerce," White said last week.

In a letter to Flemming, White pointed out that independent jobbers have greatly expanded their storage facilities as a national defense measure. Limitation of imports, he contended, would make a considerable portion of this storage idle.

"I am at the moment tempted to recommend that you proceed with the taking of such stringent steps as you deem necessary toward the end of imposing mandatory restrictions on crude oil and residual oil, if for no other purpose than to permit a conclusive determination that the formula on which you base your determinations is inaccurate and, further, that no other rigid formula will work," White wrote.

"I cannot, however, make such recommendation for the reason that the damage and the injury that would result would not be worth the price of shutting up some of these greedy pressure groups that have forced the situation to its present status."

Basis for controls . . . The basis for federal control was laid down in the Reciprocal Trade Act. It is in general terms because some members of Congress wanted to leave the way open to protect other essential domestic industries that may be threatened by imports. But it was aimed basically at the reduction of oil imports.

In its report the Senate finance committee, which wrote the provision, referred to the cabinet recommendations and said imports of oil should be kept in the same relation to domestic production as in 1954.

The provision outlines the steps to be taken to impose controls.

"In order to further the policy and purpose of this section, whenever the Director of the Office of Defense Mobilization has reason to believe that any article is being imported into the United States in such quantities as to threaten or impair the national security, he shall so advise the President, and if the President agrees that there is reason for such belief, the President shall cause an immediate investigation to be made to determine the facts.

"If, on the basis of such investigation, and the report to him of the findings and recommendations made in connection therewith, the President finds that the article is being imported into the United States in such quantities as to threaten to impair the national security, he shall take such action as he deems necessary to adjust the imports of such article to a level that

will not threaten to impair the national security."

Flemming key man . . . In this fight between industry groups, Flemming is the man in the middle trying to avoid a headache.

"I have no intention of making the Office of Defense Mobilization a national oil czar," Flemming wrote A. P. King, Jr., president of TIPRO.

An amiable, accessible man just turned 50, Flemming is an educator, not an industrialist. But in the many government posts he has held since 1939, and particularly in ODM, he has learned a lot about the oil industry and many others.

Flemming is a native of Kingston, N. Y., the holder of degrees from a dozen universities. Since 1948 he has been president of Ohio Wesleyan University, and is serving the Government on leave from that post.

His first government position was as a member of the Civil Service Commission, which he joined in 1939. During World War II, he served on War Manpower Commission and Navy Department committees. Later he was a member of the Commission on Organization of Executive Branch of Government, chairman of an Atomic Energy Commission advisory committee and a member of the International Civil Service Advisory Board. In 1951, he became assistant to Director of Defense Mobilization Charles E. Wilson, and succeeded him in 1953.

As chief of the ODM, which makes him a member of the National Security Council, Flemming is close to the administration pyramid. By invitation of the President he sits in at cabinet meetings. He is responsible for all the mobilization planning for the industrial and civilian economy and, in the NSC, is in close contact with military policy.

Imperial to Drill on Island

TORONTO.—Imperial Oil, Ltd., is going to try to find oil where others have failed on Prince Edward Island off Ontario's southern shore in Lake Ontario.

W. A. Roliff, who heads Imperial's eastern Canada exploration operations, says work on a 500,000-acre tract on the island will get under way within the next few months. The affiliate of Standard Oil Co. (N.J.) obtained a license for the exploration from Ontario's provincial government.

The deepest well ever drilled in Canada was an offshore wildcat in Hillsborough Bay near Charlottetown. It was abandoned as a dry hole at 14,686 ft.

Oil Imports Decline in July

Products slump results in over-all drop of 112,000 bbl. daily from June despite resumption of Iranian shipments

IMPORTS for the month of July were highlighted by the new record for crude from Canada and the return of Iran to the list of producing countries shipping to the United States.

Crude imports from Canada averaged 43,300 bbl. daily for the month compared with the previous record of 36,900 bbl. daily set in June. This total was split 29,200 bbl. daily to the West Coast and 14,100 bbl. daily to the Great Lakes area. Heavy crude accounted for 10,200 bbl. daily of the total that came to the Great Lakes area.

Total crude imports averaged 801,300 bbl. daily for July, 16,300 bbl. below the all-time record of 817,600 bbl. daily in June.

The drop in product imports from 391,000 to 296,000 bbl. daily, was influenced by the normal seasonal decline in residual receipts as well as the near shortage of residual in the Caribbean area. Residual receipts averaged 238,400 bbl. daily in July compared with 253,500 bbl. daily a year earlier. July imports of minor products increased over both June and July of last year.

Total imports of 1,097,000 bbl. daily were down 112,000 bbl. daily from June but still 118,000 bbl. daily above July 1954.

Crude and product exports averaged about the same as in June with increases for gasoline, kerosine, distillate, and lubes offset by reductions for crude and residual fuel. Most of the exported residual was from California. Gasoline exports were at the highest level since February of last year.

Import-export figures in the tables are compiled by the Census Bureau of the Department of Commerce.

IMPORTS INTO CONTINENTAL U. S.

(Thousands of barrels)

Crude—	July 1955	June 1955	July 1954
Mexico	752	774	160
Colombia	490	755	1,069
Venezuela	11,452	11,398	10,614
Peru	123	123	120
Ecuador	122		
Kuwait	4,657	5,528	4,127
Saudi Arabia	2,677	2,323	2,652
Neutral Zone		407	350
Iraq	565	589	
Iran	895		
Qatar	586	763	183
Canada	1,343	1,108	199
Far East	1,179	761	1,520
Total crude	24,841	24,529	20,994
Daily average	801	818	677
Products—			
Residual fuel	7,390	10,189	7,860
Other products	1,769	1,541	1,487
Total products	9,159	11,730	9,347
Daily average	296	391	302
Total all oils	34,000	36,259	30,341
Daily average	1,097	1,209	979

EXPORTS*

	July 1955	June 1955	July 1954
Crude	887	1,053	1,073
Gasoline	2,591	2,061	2,309
Kerosine	429	221	397
Distillate fuel	2,229	2,123	1,695
Residual fuel	1,872	2,406	1,883
Lube oils	1,297	1,217	1,271
Other products	1,106	1,061	920
Total all oils	10,411	10,142	9,548
Daily average	336	338	308

*Excludes shipments to territories.

Flow of Canadian Crude to Increase

LOS ANGELES.—The Pacific Coast's crude-oil supply will rise an average of 3 per cent annually between now and 1960, but the states will depend on most of the increase from Canadian imports rather than home-produced crude.

Reese H. Taylor, president of Union Oil Co. of California, made these remarks in an address on September 20 before the Los Angeles Society of Security Analysts. He also told the group that Union's modernization and expansion programs at its refineries had upped production of lighter products from 38.6 per cent to 43.7 per cent.

Referring to the future of crude-oil on the West Coast, Taylor said:

"For the long term, we expect total Pacific Coast demand to average 1.3 million barrels daily in 1960, as compared with 1,155,000 bbl. last year. Civilian demand of 954,000 bbl. daily last year is expected to rise to 1,140,000 by 1960. Our estimates conservatively contemplate a sustained growth rate of 3 per cent annually.

"On the supply side, a substantial increase in California's current crude-oil production does not appear to be in the cards. The increase in total West Coast crude-oil requirements will be largely accounted for by Canadian production."

Taylor also predicted that gasolines and jet fuels will account for nearly half the total demand in 5 years as compared to 43 per cent last year.

Imports Still Going Up

Receipts for year now expected to average 1,123,100 bbl. daily, a 13.97 per cent gain, Texas commission reports

IMPORTERS have raised their estimates of the year's receipts of foreign crude and products only slightly over the past month, according to reports filed with the Texas Railroad Commission.

A month ago, the reporting companies said they expected their total imports for the year to average 1,118,400 bbl. daily for a gain of 133,100 bbl. daily or 13.5 per cent over 1954.

Revisions in the September reports to the commission raised the expected total for the year to 1,123,100 bbl. daily for a gain of 13.97 per cent over last year. The upward revision amounted to 4,700 bbl. daily, including 3,400 bbl. daily more crude and 1,300 bbl. daily more products.

The shift toward more crude and less products also shows up in the estimates for January 1956.

Total reporting companies' schedules for next January call for a reduction in total imports, compared with January 1955, amounting to 19,400 bbl. This net reduction is made up from an increase of 61,700 bbl. daily for crude imports and a reduction of 81,100 bbl. daily for products. Crude will be up 8.6 per cent and products down 16.0 per cent.

Most of the January increase in crude will be on the West Coast. Out of the total projected increase of 61,700 bbl. daily, receipts on the West Coast will account for 48,800 bbl. daily. Gulf and East Coast importers will bring in 12,900 bbl. daily more than last January. The shift shows up even more on a percentage basis. Gulf-East Coast crude imports for January will be up 2.0 per cent over last January compared with a gain of 77.6 per cent for the West Coast.

Reports to the Texas Railroad Commission do not cover crude imports by some of the refiners in the Great Lakes area. The Census Bureau reported 14,100 bbl. daily for this area in July. Company reports of product imports represent only about 80 per cent of the total.

Here Are Companies' Import Figures

(Thousands of barrels daily)

	—Actual*—		—Estimated or forecast*—				
	Aug. 1954	Aug. 1955	Sept. 1955	Oct. 1955	Nov. 1955	Dec. 1955	Jan. 1956
CRUDE—EAST COAST:							
Atlantic Refining Co.	54.3	68.2	61.7	61.7	61.7	61.7	61.7
Cities Service Co.	14.3	32.1	20.0	32.3	28.9	21.0	25.0
Eastern States Petroleum Co.	10.8	25.6	15.0	20.5	20.5	20.5	20.5
Gulf Oil Corp.	121.0	101.0	155.0	131.0	131.0	131.0	131.0
McBride Oil & Gas Corp.		2.6	4.2	3.2	3.3	3.2	3.2
Phillips Petroleum Co.	6.4	10.0	10.0	9.7	10.0	9.7	9.7
Sinclair Oil Corp.	67.2	70.7	73.5	73.5	73.5	73.5	73.5
Socony Mobil Oil Co.	89.6	63.7	64.0	64.0	64.0	64.0	64.0
Southwestern Oil & Refining Co.		3.6	3.7	3.6	3.7	3.6	(¶)
Standard Oil Co. of California	75.0	64.0	74.2	74.2	74.2	74.2	74.2
Standard Oil Co. (Ind.)	13.3	16.1	15.6	16.3	17.0	13.2	12.9
Standard Oil Co. (N. J.)†	78.0	72.0	79.0	79.0	79.0	79.0	79.0
Sun Oil Co.	10.8	28.0	33.1	25.0	27.5	27.3	27.3
The Texas Co.	54.9	65.5	58.7	50.8	69.2	76.3	65.5
Tide Water Associated Oil Co.	9.7	14.7	15.7	16.2	11.7	14.8	15.7
Total East Coast	605.3	637.8	683.4	661.0	675.2	673.0	666.8
CRUDE—WEST COAST:							
Shell Oil Co.		8.2	10.7	26.7	41.9	33.1	33.3
Socony Mobil Oil Co.		26.3	27.0	27.0	27.0	27.0	27.0
Standard Oil Co. of California	22.3	28.8	16.5	16.5	16.5	16.5	16.5
The Texas Co.	9.7	13.8	11.7	16.5	18.0	16.1	11.3
Tide Water Associated Oil Co.	16.9	33.3	33.1	29.2	34.5	21.4	23.6
Total West Coast	48.9	110.4	99.0	115.9	137.9	114.1	111.7
Total crude	654.2	748.2	782.4	776.9	813.1	787.1	778.5
PRODUCTS:							
Asiatic Petroleum Co.	1.0	6.6	1.5	2.7	4.5	4.5	4.3
Eastern States Petroleum Co.	15.8	14.0	17.3	17.3	17.3	17.3	17.3
Gulf Oil Corp.	4.0	8.0	7.0	6.0	6.0	6.0	6.0
Shell Caribbean Petroleum Co.‡	64.0	93.0	92.0	118.0	127.0	135.0	168.0
Shell Oil Co.	14.4	25.6	24.7	17.6	19.6	22.2	22.5
Sinclair Oil Corp.	3.0	1.7					
Socony Mobil Oil Co.	6.9	11.0	10.8	10.8	10.8	10.8	7.6
Standard Oil Co. (Ind.)§		17.8	22.2	20.4	25.0	25.8	32.3
Standard Oil Co. (N. J.)†	109.0	86.0	90.0	195.0	195.0	195.0	169.0
Total products	218.1	263.7	265.5	387.8	405.2	416.6	427.0
Total crude and products	872.3	1,011.9	1,047.9	1,164.7	1,218.3	1,203.7	1,205.5
Bonded fuel included‖	51.9	58.5	55.0	44.0	46.0	46.8	(**)

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Imported by independent distributors. §Received through suppliers who can furnish either domestic or foreign oil. ¶Unreported by company but an average of 3,600 bbl. is included in the total. ‖Mostly duty free for bunkering ships in foreign trade. **Separation of bunker fuel not reported by some companies.

CRUDE IMPORTS

(Thousands of barrels daily)

	1954	1955	Per cent change
January	600.8	716.8	19.3
February	609.1	747.3	22.7
March	642.3	721.4	12.3
First quarter	617.7	727.9	17.8
April	571.8	669.4	17.1
May	723.5	721.7	—0.2
June	617.5	779.6	26.3
Second quarter	638.5	723.5	13.3
July	678.8	762.4	12.3
August	654.2	748.2	14.4
September	656.0	782.4	19.3
Third quarter	663.1	764.1	15.2
October	656.1	776.9	18.4
November	626.0	813.1	29.9
December	720.2	787.1	9.3
Fourth quarter	667.9	792.1	18.6
Year	647.0	752.1	16.2
	1955	1956	
January	716.8	778.5	8.6

PRODUCT IMPORTS

(Thousands of barrels daily)

	1954	1955	Per cent change
January	450.5	508.1	12.8
February	482.6	519.0	7.5
March	346.9	451.8	30.2
First quarter	424.8	492.0	15.8
April	301.0	356.9	18.6
May	272.2	327.1	20.2
June	268.8	306.7	14.1
Second quarter	280.6	330.2	17.7
July	254.1	253.6	—0.2
August	218.1	263.7	20.9
September	247.8	265.5	7.1
Third quarter	240.2	260.9	8.6
October	328.2	387.8	18.2
November	414.2	405.2	—2.2
December	485.1	416.6	—14.1
Fourth quarter	409.1	403.2	—1.4
Year	338.4	371.0	9.6
	1955	1956	
January	508.1	427.0	—16.0

Pipeline Laid Rapidly

Southern Pacific's Los Angeles-Phoenix, El Paso-Phoenix lines to be completed 10 months after engineering begun

D. H. Stormont

LOS ANGELES.—One of the most rapid timetables ever undertaken in the pipeline industry is being followed on products lines Southern Pacific Pipelines, Inc., is building between Los Angeles and Phoenix and El Paso and Phoenix.

Detailed design and survey of the 842-mile system didn't start until March 1. Acquisition of right-of-way was begun in mid-April. First pipe was laid June 6. And by mid-September about 400 miles of the line was in the ground.

The whole $30,000,000 project is to be completed by the end of the year—a scant 10 months after engineering work was started.

For one thing, there were almost no right-of-way problems. The common-carriers mostly follow the route of the parent Southern Pacific Railway system.

To meet the rapid construction program, seven contractor groups are laying the lines in eight schedules. Most of the route is across desert but there are some mountains. The desert heat during summer months limited lowering-in and backfilling operations to the early-morning hours because of expansion and contraction problems.

New railroad venture . . . The pipelines are the first such major undertaking by a railroad. They will move light petroleum products to an area which up to now has received them by tank truck and tank car.

Rather than lose tank-car business to a pipeline some day, Southern Pacific got into the pipeline business itself.

It will be able to move 42,000 bbl. daily from Watson, near Los Angeles, over the 62 miles of 16-in. line to Colton, Calif., with three centrifugal pumps driven by 900-hp. motors. Three 900-hp. pumps at Colton will push 36,000 bbl. daily over 356 miles of 12-in. to Phoenix.

A 424-mile, 8-in. line will move products from El Paso westward to Tucson and Phoenix with a single station, equipped with two 300-hp. pumps. They will discharge 13,600 bbl. daily. All stations are now under construction.

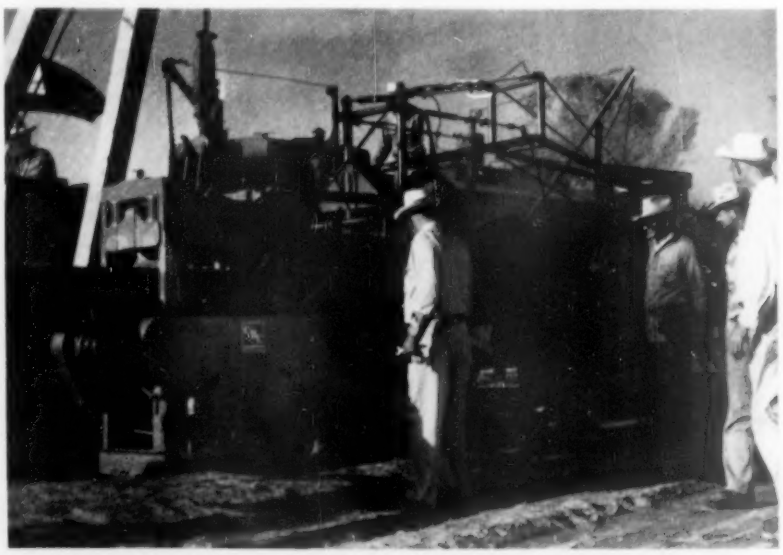
Products schedule . . . Products will be shipped from El Paso and Wilmington, Calif., refineries on about a semimonthly cycle. Identification of products—regular, premium, and aviation gasolines, diesel oil, and jet fuels—will be made by gravitometers. Dye plugs and scrapers will be used for segregating individual shipments of various products.

The lines were designed by Management Engineers, Inc., a Bechtel Corp. subsidiary, which acted as agent for their construction. D. L. Roberts is vice president and project manager.

Southern Pacific Pipeline's officers are D. J. McGanney, president; E. E. Mayo, vice president; and F. E. Kalbaugh, general manager.

Contractor groups, their jobs, and starting dates are:

Morrison-Knudson Co., Inc., El Paso to Lordsburg, N. M., 156 miles of 8-in., June 6; R. H. Fulton & Co., 144 miles of 8-in., Lordsburg to Tucson, mid-July; Hood Construction Co., 122 miles of 8-in., Tucson to Phoenix, and 35 miles of 12-in., Phoenix to Hassayampa, early August; Macco Corp. and Alex Robertson Co., 127 miles of 12-in., Hassayampa to Yuma, early August; Conyes Construction Corp., 195 miles of 12-in., Yuma to Colton, mid-July; Young Pipe Line Contractor, Inc., 42 miles of 16-in., Colton to La Habra, early September; and Engineers, Ltd., Pipe Line Co., 19 miles of 16-in., La Habra to Watson, about mid-September.



A NEW TYPE COATING machine is being used on Southern Pacific's line. The machine is hydraulically powered and directly cradled by a tractor. Hydraulic motors drive the machine's crawler wheels and wrapping head. Power comes from a hydraulic pump driven by an engine on the dope kettle. A water-cooling unit is located behind the machine.

Ashland Shifts Output

Louisville refinery will be converted to petrochemicals, other plants enlarged in $8 million modernization plan

ASHLAND, Ky.—Ashland Oil & Refining Co. will move into petrochemicals when it completes an $8 million expansion and modernization program now under way.

Ashland has announced that the Louisville refinery, operated by its subsidiary Aetna Oil Co., will be closed during the last half of October and the entire 11,000-bbl. plant will be converted to producing various basic chemicals from petroleum.

The conversion will take several months. The company has made provisions to relocate all Louisville employes who wish to be transferred to other Ashland refineries. Job openings have been created or left unfilled during the past several months to accommodate Louisville employes at the Catlettsburg, Buffalo, Canton, and other plants.

At this time, the company has not decided definitely what chemicals it will produce. Louisville is an important chemical center, and a demand for such basics as ethylene, butadiene and chlorinated hydrocarbons exists locally.

The decision to locate petrochemical manufacture at Louisville was influenced by the local market, plus the fact that the company could not expand its plant site there for greater refining capacity. The refinery consists of crude distillation, thermal cracking, and visbreaking facilities. In order to modernize and expand it to an economical 20,000-25,000-bbl. daily capacity more room was needed. But none was available.

The markets supplied by Louisville will be taken over by production from Ashland's Catlettsburg refinery. There, contracts have been let to Procon, Inc., for a new 55,000-bbl. per day crude unit and a fluid catalytic cracking unit capable of charging 25,000 bbl. per day of fresh feed.

The new crude unit to be built at the No. 2 plant will permit retirement of some existing capacity. When completed, it will boost maximum crude charging capacity to about 75,000 bbl. per day. The new fluid unit, augmenting a World War II T.C.C. unit, will give Catlettsburg a total catalytic cracking capacity amounting to nearly 80 per cent on crude.

A 6,000-bbl. per day Houdriformer, completed there early this summer, is equipped with a guard case which permits the hydrodesulfurization of 9,000 bbl. per day of total naphtha feed. This enables the company to treat a light straightrun naphtha which is not reformed, realizing a 4 to 5-octane number improvement on its tetraethyl lead susceptibility.

The company invited bids 2 weeks ago for a 6,000-bbl. per day catalytic reforming unit to be built at the Frontier refinery at Buffalo. Also included in the company's current program will be a catalytic reformer for the Findlay, Ohio, refinery and hydrodesulfurization units for both Buffalo and Findlay. To date, $2½ million of the proposed $8 million construction program has been contracted.

Plant Offer Made

Company bids $150,000 for bankrupt refinery

WILLISTON, N. D.—Westland Oil Co., of Minot, N. D., submitted a high bid September 21 of $150,000 for the Williston Basin Refining Corp. refinery here. It must be approved by the U. S. referee in bankruptcy at Fargo, N. D., who has not yet set a hearing on whether or not to confirm the sale.

Continental Supply Co. and Parkersburg Rig & Reel Co., oil supply firms which are secured creditors in the bankrupt corporation, offered a joint bid of $146,000. It was the only other group or firm to bid.

The public auction was ordered after the corporation was declared bankrupt July 21.

The 2-year-old refinery's worth had been appraised at $390,000. Its maximum capacity is 2,000 bbl. daily. It also had a 300-bbl. daily Catformer.

Secured creditors hold mortgages of approximately $210,000.

Westland is a North Dakota corporation, which markets oil products there and in Montana.

Northern Files New Plans

OMAHA. — Northern Natural Gas Co. has revealed plans to add 645 miles of pipeline and an additional 12,640 hp. in compressor capacity to its system in Wisconsin, Minnesota, South Dakota, and Iowa.

The request was filed as a supplement to several applications which Northern has pending before the Federal Power Commission. These applications were previously consolidated with Northern's proposal to import Canadian gas. However, it now appears that Northern will not be able to make satisfactory import arrangements in the near future.

The over-all new project will cost $32,000,000 and will include 348 miles of main line additions and 307 miles of branch lines. The major portion of the main lines will include 169 miles in the Duluth-Superior area to serve a total of 25 towns and three industrial customers and 164 miles in South Dakota, extending to the Aberdeen area.

Jersey Story Ready

First of 4-volume history is pioneering venture

NEW YORK.—The first volume of a 4-volume history of Standard Oil Co. (N.J.) will be published in November ending an 8-year period of preparation by Business History Foundation, Inc.

The 800-page volume, "Pioneering in Big Business," was written by Dr. Ralph W. Hidy, professor of history at New York University, and Dr. Muriel E. Hidy, an associate of the foundation. The initial volume not only documents the first 29 years of Jersey Standard's growth, but traces the history of the oil industry in that period as well.

The book is hailed as the first history of a large American corporation to be written by a group of scholars with unrestricted access to company records.

The foundation reached an understanding with Jersey Standard that it would make available all records and documents, permit interviews with employes, and obtain assistance from all its affiliated companies. Jersey also agreed that the foundation would have complete freedom in its findings and interpretation of research in writing the history.

The company's original grant to the foundation was enough to complete the entire project. Jersey Standard said last week this was to avoid any implication that the foundation might be subject to financial pressure during the preparation of the history.

In the first volume's preface, Dr. Henrietta M. Larson, associate professor of business history at Harvard and editorial director of the foundation, writes, "The company's executives took a momentous step, without precedent among large American corporations, when they granted scholars over whom they had no control unrestricted access to company records and complete freedom of publication."

Untapped Oil Pay Seen

Canada's western foothills predicted as scene of future major strikes in Mississippian and Jurassic formations

Henry D. Ralph

JASPER, Alta.—Recent discoveries in the foothills regions of Alberta and British Columbia indicate the Mississippian and Jurassic formations will become extremely important producing zones in western Canada. Within the next 20 years they may prove up as much oil as the Cardium formation and the Devonian group.

This was cited in the keynote address to the western Canada regional meeting of the American Association of Petroleum Geologists and the Alberta Society of Petroleum Geologists here. The paper was prepared by J. C. Sproule, of Sproule & Associates, Calgary. But because of Sproule's illness it was presented by Theodore A. Link, of Link, Downing & Cooke, Ltd., Calgary.

The Mississippian and Jurassic are daily increasing in importance as petroleum and natural-gas reservoirs. They warrant more careful study than they have received, Sproule said. The Mississippian covers an area of 270,000 sq. miles—about the size of the state of Texas—and has an average thickness of 1,300 ft. The Jurassic covers 190,500 sq. miles with an average thickness of 675 ft.

More fields to come . . . The Mississippian lies with slight unconformity over the Devonian, and is covered by the Jurassic which forms an excellent cap rock. But Sproule said more must be learned about their structural and facies conditions. He declared the Mississippian, particularly, presents ideal conditions for the formation and entrapment of oil. He added that the few individual reservoirs found to date will be followed by many much larger ones.

A number of relatively small fields are producing from the Mississippian in Saskatchewan and Manitoba. The formation, however, has not yielded commercial quantities of oil in southern Alberta despite the large number of wells drilled in the vicinity of the Sweet Grass arch.

Sproule explained this as due to lack of knowledge of structural and facies conditions. Also many of the unsuccessful wells were drilled without benefit of present improved exploration knowledge and up-to-date completion practices.

Prior to 1944, Turner Valley was the only Mississippian field of any importance. Since then, exploration in the foothills region has discovered important Mississippian pays in Jumping Pound, Pincher Creek, Savanna Creek, and other fields in British Columbia. During the last 2 years, Sproule said, the industry has come to have a new appreciation of possibilities of the Mississippian in the foothills and mountain regions.

Hope for Jurassic . . . The record of Jurassic discoveries has been disappointing. But Sproule said that recent gas discoveries in the Jurassic Nikanassin formation of west-central Alberta foothills and northeastern British Columbia, such as Buick Creek and Blueberry, make it safe to forecast that many more producing structures will be located.

Considering the porosity of various Jurassic reservoirs, he said, future of the Jurassic falls far short of that of the Mississippian, but it will still take an important place in the western Canada reserve picture.

Present reserves in the four western provinces, Sproule said, include 4,145 billion cubic feet of gas and 581,900,000 bbl. of oil in the Mississippian. An estimated 100 billion cubic feet of gas and 169,000,000 bbl. of oil are in the Jurassic.

Sproule predicted that during the next 20 years additional discoveries in the Mississippian will total 40,000 billion feet of gas and 7,860,000,000 bbl. of oil. The Jurassic will yield 8,300 billion feet of gas and 790,060,000 bbl. of oil. He predicted the great bulk of these discoveries will be in the foothills and mountain areas of western Alberta and northeastern British Columbia.

For comparison, he said presently known reserves in the Cretaceous (about 90 per cent Cardium) are 1,166,593,000 bbl. of oil, and in the Devonian 2,049,154,000 bbl.

Committee planned . . . The keynote address opened a 2-day symposium on the Jurrassic and Carboniferous during which 24 papers were presented dealing with the stratigraphy, lithology, paleontology, and correlation of these zones in various localities of western Canada.

It was agreed to set up a joint committee from the provinces of Alberta and Saskatchewan and the states of Montana and North Dakota to work out a regional system of nomenclature and correlation.

The meeting was followed by 2 days of field trips studying outcroppings of sedimentary rocks in the Jasper-Banff region of the eastern slopes of the Canadian Rockies.

Marine Line Ready

Crude starts flowing from fields off Louisiana coast

MORGAN CITY, La.—The world's longest submarine pipeline has started moving oil and gas to the Louisiana coast from fields as far as 25 miles in the Gulf of Mexico.

Oil and gas now filling the line is expected to reach Burns Terminal near here about October 1.

The 48-mile line, built at a cost of about $7,000,000 is owned jointly by Magnolia Petroleum Co., as operator, Continental Oil Co., and Newmont Oil Co. It extends from Eugene Island Block 126 field and also taps production in Block 45 field nearer the coast.

The three-company group now has 32 oil and gas wells in fields served by the new line. Daily production averages about 6,200 bbl. Capacity of the 12-in. line is approximately 60,000 bbl. per day.

Operators announced that the line will be extended eventually to Block 128 field, 8 miles southwest of its present origin. Another line, now under construction, will extend from Burns Terminal 8 miles north to Louisiana's intracoastal canal. This extension, scheduled to be completed about November 1, will move separated crude oil from Burns Terminal to intracoastal barges for transportation to refineries at Beaumont, Tex., and Lake Charles, La.

Fluid is separated and measured at one of the central separator platforms in the offshore fields, then commingled for transmission to shore. The fluid again is separated at Burns Terminal.

Load Restrictions Appealed

CALGARY.—Stringent overloading restrictions on Alberta highways have prompted the Canadian Association of Oilwell Drilling Contractors to appeal to Premier Ernest Manning for relief.

The Saskatchewan government recently recognized that some drilling equipment is indivisible and eased regulations governing permits on its highways. However, Alberta Highways Minister Gordon Taylor has turned down requests for similar action in his province. Drilling contractors have asked Manning to overrule Taylor and ease the overloading requirements.

Escape Clauses Invalid?

FPC examiner rules provision does not permit Skelly to stop sales; appeal planned to FPC, courts if necessary

WASHINGTON.—Escape clauses written into many natural-gas supply contracts as a hedge against subsequent federal control may be killed by the Government.

This was the indication of a Federal Power Commission examiner, who last week ruled such clauses to be invalid. The question is expected to be reviewed by the full commission next month.

The escape clause, incorporated in many contracts in force at the time of the Supreme Court decision in the Phillips case, provides for the termination of gas deliveries in the event any federal agency asserts jurisdiction over the sale.

The first step in knocking out escape clauses was an FPC examiner's ruling against Skelly Oil Co., Tulsa, which was deemed to be a natural gas company thus subject to FPC authority. The examiner ruled that Skelly would have to restore natural-gas service to the Lone Star Gas Co., Dallas, which it cut off last November 30.

The decision is the latest in a series of cases in which the FPC asserted its intention to regulate sales of independent natural-gas producers right from the wellhead on *(The Oil and Gas Journal, September 19, page 86).*

Appeal due . . . Hawley C. Kerr, general counsel for Skelly, said the company would appeal the ruling to the FPC. Should commission action be unfavorable, he said, relief will be sought in the courts.

Examiner Edward F. Marsh found that Skelly disconnected its facilities for deliveries to Lone Star the day after it cut off service. The gas which had been moving to Lone Star was thereafter sold to Oklahoma Natural Gas Co., Tulsa.

The FPC issued a suspension of Skelly's notice of termination on November 30, and in January began hearings on status of Skelly under the Natural Gas Act.

Skelly's position . . . Skelly delivered the gas at its Velma gasoline plant in Stephens County, Oklahoma. It claimed it was not subject to the Natural Gas Act; that it does not make any sale of gas from the Velma plant in interstate commerce for resale, and that it does not own or operate any facilities subject to FPC jurisdiction in connection with the Velma sale.

Skelly also contended that its contract with Lone Star terminated because of the escape clause. The company argued further that even if the sale should be declared subject to FPC control and the escape clause ineffective, it was still at liberty to discontinue the service because it had not applied for or received an FPC certificate authorizing the sale.

Examiner's reasoning . . . Marsh ruled that all of the production and gathering had been completed at the point where the processed gas moved into a 400-ft. pipeline for delivery to Lone Star at a point about 6 ft. inside the Velma plant fence. From this point, he said, the gas continued to flow in a continuous and uninterrupted stream through Lone Star's facilities into Texas. Thus, he said, Skelly is a natural gas company under the act.

Accordingly, Marsh continued, termination of service to Lone Star was an abandonment without the permission and approval of the FPC. "Present and future public convenience and necessity require" that service be restored, and the disconnected facilities replaced, reinstalled and restored.

Marsh held the contention that the contract was terminated by its own terms was not valid. He said it would not relieve the company of the obligation to continue service unless permission for abandonment was first obtained. He also held that Skelly's failure to comply with the certificate requirements must be corrected.

Production, Flaring Curbed

DENVER.—The Colorado Oil and Gas Conservation Commission has set limits on the flaring of natural gas and production of oil in the rich Rangely field in the northwestern section of the state.

Effective October 14, no more than 30,000 cu. ft. of gas may be burned off daily from any one well. Oil production must be held to 275 bbl. daily from each well.

Last May the state Supreme Court voided a commission order requiring reinjection of dry gas in the state's largest field. It ruled the agency overstepped the authority vested in it by the state legislature.

The commission estimated the total amount of gas produced from the Weber formation to last July 1 was 111,400,000,000 cu. ft., that at least 30,000,000,000 cu. ft. has been wasted by operators, and that 85,000,000 additional cubic feet would be flared daily if there were no restrictions. It termed this an "unreasonable" amount.

In holding oil production to 275 bbl. daily per well, the commission said unlimited output would cause unreasonable drainage and waste, and would "abuse and violate the correlative rights of certain owners and operators."

Microwave System Begun

PERRY, Okla.—Construction of the petroleum industry's largest privately-owned microwave system was kicked off here last week.

Work began at Perry on the first of 27 stations making up the 708-mile, $1,000,000 system which will be built between Houston and Ponca City, Okla.

The big system, jointly owned by Continental Pipe Line Co. and Sinclair Pipe Line Co., will have a capacity of 120 voice channels and about 85,000 channel miles of voice circuits. This is almost half as many channel miles as in the rest of the oil-industry microwave systems combined *(The Oil and Gas Journal, July 18, page 72).*

San Juan Basin Has Oiler

FARMINGTON, N. M.—Gas exploration in the San Juan basin stepped aside for an indicated oil discovery last week. El Paso Natural Gas Co. recovered 800 ft. of free, 34°-gravity oil on test of the 1 Kelly-State in San Juan County, 12 miles southwest of closest production.

The discovery is apparently of commercial value. The recovery is from what is being called the Gallup of Upper Cretaceous age. This formation is thought to be the same as the Tocito formation which produces oil in South Blanco field. Perforations were made at 4,780-4,819 ft. Coring is now below 4,970 ft. at the well.

Texas County Has First Oil

CAP ROCK, Tex.—Crosby County in West Texas has been added to the state's list of oil-producing counties.

Bond Oil Co., of Big Spring, Tex., opened Glorieta production at 1 Robertson. Potential was 83.77 bbl. of 40°-gravity oil a day on the pump. Production was from 3,769-76 ft. Gas-oil ratio was zero.

Location is southwest of Cap Rock, almost on the county line. It is 1½ miles northwest of Aycock-Glorieta pool in Garza County. This was opened last month at W. M. and A. P. Fullers 1 Frankie Irwin.

U.S. Gas Requirements and Supply—Natural-Gas Companies

(Millions of therms)

Requirements—	1953	1954	1955	1956	1957	1958
Residential:						
General	5,913.7	6,490.3	7,009.0	7,428.9	8,117.3	8,445.9
Space heating	10,195.0	11,493.5	13,107.1	14,370.0	15,790.4	16,847.1
Total residential	16,108.7	17,983.8	20,116.1	21,798.9	23,907.7	25,293.0
Commercial	4,499.0	4,859.1	5,381.1	5,760.6	6,185.8	6,456.6
Industrial and other	19,967.0	20,683.9	22,334.2	23,839.7	25,069.3	25,871.5
Total firm requirements*	40,574.7	43,526.8	47,831.4	51,399.2	55,162.8	57,621.1
Company use	3,611.3	3,854.7	4,239.0	4,574.1	4,859.2	5,073.5
Underground storage:						
Injection	4,097.9	4,147.1	4,546.9	5,469.2	5,577.5	6,084.0
Withdrawals	2,377.7	3,249.1	3,710.5	4,171.2	4,773.4	5,286.8
Net	1,720.2	898.0	836.4	1,298.0	804.1	797.2
Unaccounted for	2,418.1	2,497.3	2,627.2	2,729.6	2,842.0	2,924.9
Total firm requirements	48,324.3	50,776.8	55,534.0	60,000.9	63,668.1	66,416.7
Supply available from existing and planned facilities—						
Natural gas (purchased and produced)	64,151.3	67,516.2	72,050.3	76,294.4	79,949.3	82,581.6
Manufactured and L.P.G.	72.2	38.1	58.0	123.9	121.9	135.3
Total gas supply	64,223.5	67,554.3	72,108.3	76,418.3	80,071.2	82,716.9
Net excess over firm requirements	15,899.2	16,777.5	16,574.3	16,417.4	16,403.1	16,300.2
Interruptable—sales and company use	14,733.2	16,064.3	16,008.5	15,841.8	16,094.2	16,187.8

*Ultimate consumers.

Gas Demand to Rise Sharply by 1958

TOTAL residential requirements for natural gas in 1958 are expected to be 40.6 per cent more than in 1954. Commercial requirements will gain 32.9 per cent compared with an increase of 25.1 per cent for industrial and other needs.

At least 26 per cent of peak-day supply during the 1958-59 heating season will come from underground storage. This availability of stored gas represents an increase of 78 per cent over peak-day withdrawals for the 1954-55 winter.

These forecasts are taken from the third comprehensive survey of national and regional gas requirements and supply by the American Gas Association.

The survey covers supply and demand for gas in the United States, detailed by 10 regions, for the period 1954-58. In the breakdown by types of gas, artificial and mixed gases are combined for comparison with data on straight natural.

Natural-gas figures for the United States are shown in the accompanying table. The totals in this table do not include any natural used in mixed gases.

The largest net addition to underground storage is expected in 1956 when the increase will be 1,298,000,000 therms. (A therm is roughly equivalent to 95 cu. ft. of natural gas.) Gross withdrawals will reach a record of 5,287,000,000 therms in 1958 with 112,812,000 therms on the peak day of that year.

The regional breakdown of the survey shows a need for additional supplies in the Appalachian and Mid-Continent regions to meet demands this year. Companies in the Southeast say they will need more gas in 1956 while the currently projected supply for the Great Lakes area in 1957 will not meet the expected demand. Other areas are reported to have satisfactory supply-requirement relationships for the survey period.

Material requirements of gas utility and pipeline companies are shown in the small table. Figures for 1953 from last year's survey are included in both tables. Total steel requirements for the 4-year period ending 1958 will be 6,413,000 tons, including 6,214,000 tons of steel pipe.

The complete survey report is available from the Bureau of Statistics of the American Gas Association, New York for $2 per copy.

Material Requirements, Gas Utility and Pipeline

(Thousands of tons)

	Actual	Estimated					
	1953	1954	1955	1956	1957	1958	Total 1955-1958
Steel pipe:							
16 in. and larger	1,508	890	1,282	835	640	240	2,997
6⅝ but less than 16 in.	359	457	507	468	350	312	1,637
Less than 6⅝ in.	201	407	450	431	364	335	1,580
Total steel pipe	2,068	1,754	2,239	1,734	1,354	887	6,214
Other steel	51	50	56	44	38	61	199
Total steel	2,119	1,804	2,295	1,778	1,392	948	6,413
Other material:							
Cast iron	127	236	221	224	192	178	815
Copper	2.778	1.746	2.192	2.044	1.887	1.792	7.915
Aluminum	0.241	0.085	0.386	0.157	0.156	0.139	0.838

El Paso Plans Out

FPC denies firm's bid to import Canadian gas

WASHINGTON. — The Federal Power Commission last week practically ruled out El Paso Natural Gas Co. as a buyer of Canadian gas which Pacific Northwest Pipeline Corp. plans to import.

As hearings of Pacific's application resumed after a summer recess, the FPC dismissed four of six alternate plans offered by El Paso for the purchase of Canadian gas from Pacific Northwest. The remaining two provided that gas from Permian and San Juan basins would be taken. All of the Canadian gas taken by Pacific would be sold in its own markets.

As hearings resumed, the FPC was told that nearly all of the route of Westcoast Transmission Co., the Canadian supplier, has been located. More than half of the route has been surveyed, and right-of-way, mostly government lands, are now being acquired.

Ray Hamilton, vice president of the Bechtel Corp., reported that some 360 miles of the 650-mile line is expected to be completed next year, and the line will be placed in operation in 1957.

Pacific is asking the FPC for authority to take 300 million cubic feet daily of Canadian gas from Westcoast near Sumas, Wash. *(The Oil and Gas Journal, September 19, page 96.)*

New Line One-Third Built

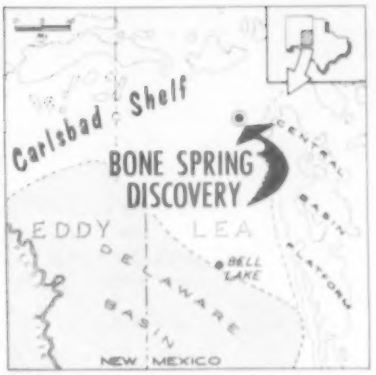
CALGARY. — Officials of Peace River Oil Pipe Line Co. report about one-third of the firm's 100-mile crude line from Sturgeon Lake producing area to Edson has been completed. Completion date has been set for December 1.

A gathering system will tie the Sturgeon Lake, South Sturgeon Lake, and Little Smoky oil fields to the Peace River line which will connect at Edson with Trans-Mountain Oil Pipe Line Co.'s main artery.

Offshore Well Finaled

LOS ANGELES.—Douglas Oil Co. has completed its first well on a 320-acre state leased tidelands parcel off Huntington Beach for a reported 100 bbl. per day.

Production is from the Jones sand, the object of wholesale drilling on shore. The well was slant drilled from an upland site. Bottomed at 3,855 ft., it was plugged back to 3,800 ft. Tanks were being installed at the site.



New Pay Found

Shell finds first flowing oil in Bone Spring facies

ROSWELL, N. M. — New Mexico's first flowing oil production in the Delaware basin's Bone Spring facies has been discovered by Shell Oil Co.

Opening of the new pay by Shell 1 Hooper may shed light on the theory held by many geologists that the Delaware basin extends northward beyond the buried Capitan reef limits.

The flowing producer, located in Lea County, southeastern New Mexico, is a recompletion. Originally completed this year from the Pennsylvanian at 12,920-13,050 ft., it flowed 133 bbl. of oil a day. But the flow soon died and operators moved in to rework the hole.

The subsequent 13-hour flow test in the Bone Spring at 8,198-8,272 ft. produced just over 151 bbl. of 27.7° (corrected) oil through 1-in. choke, giving the well a calculated daily potential of 279 bbl. Flowing pressure was 50 psi. and gas-oil ratio was 840:1.

The flow is unusually good and will greatly encourage explorers of the Delaware basin. But accumulated data on the Bone Spring as a producing formation provides very little basis for optimism.

Throughout the basin, there is a history of wells which had good shows in the Bone Spring while drilling. Operators generally felt that should their hole be dry at total depth, it could be plugged back to make commercial production. But hopes were scotched by poor permeability. Production rewards after plugging back have proved disappointingly small.

Bone Spring shales are a member of the Leonard series, Permian in age. They are comparable to the Yeso and Abo which produce oil in Central Basin platform fields in New Mexico, and to the Clear Fork and Spraberry in West Texas.

So far as is known, the Bone Spring pay is restricted to the Delaware basin, the Carlsbad shelf, and the Guadalupe and Delaware Mountains. Discovery of flowing oil from this formation, sparking interest in further drilling, is prompting a brand-new look at the Delaware basin.

Refinery Expansion Continues

TULSA.—D-X Sunray Oil Co. has completed one phase of a $2,800,000 modernization project at its 64,000-bbl. West Tulsa refinery and expects to complete the entire job by late October.

Work was finished recently on expanding capacity of the plant's 22,000-bbl. fluid cat cracker to about 28,000 bbl. daily by installing an air blower and making other vessel changes.

Plant officials also reported they expected crews of M. W. Kellogg Co. to complete work on a $2,500,000, delayed coking unit late next month. When this 7,000-bbl. unit is put into operation it will absorb the refinery's entire output of residual fuel, converting it into gas oil and coke. The gas oil will be charged to the cat cracker and the 250 to 275 tons daily of coke will be marketed.

The refinery recently began receiving its first shipments of natural gasoline over the new line of Okan Pipeline Co. from the big Hugoton gas field. The refinery is the southern terminus of the 353-mile, 6-in. line *(The Oil and Gas Journal, July 18, page 66)*.

D-X Sunray plant is scheduled to take about 2,900 bbl. daily of the products through September, stepping up its take to 3,000 bbl. next month. A daily run of 5,000 to 7,000 bbl. may be reached later. D-X Sunray will use the natural gasoline for blending.

Pipeline Project Sublet

HOUSTON.—Brown & Root, Inc., has subcontracted 221 miles of construction work on American Louisiana Pipe Line Co.'s natural-gas project to Associated Pipe Line Contractors and Western Contractors. Brown & Root holds the prime contract on a 260-mile segment of the line.

The subcontractors will lay 196 miles of 30-in. and 25 miles of 26-in. pipe. Brown & Root will retain the contract for 39 miles of 16-in. line to be laid under water.

The entire 260-mile southern section of the project will extend from North Tepetate, La., to the Arkansas-Louisiana border. H. C. Price Co. and Houston Contracting Co. hold contracts for the 783-mile, 30-in. section from the Arkansas-Louisiana border north to Detroit.

Alabama Lease Play Big

637-acre school tract 4¼ miles from Citronelle wildcat brings bonus of $115,637 as well as 19 per cent royalty

MOBILE, Ala.—Intensity of the current lease play around Alabama's recent oil discovery became a matter of public record last week. And even some of the participants could hardly believe their eyes.

The Mobile city-county school board accepted a $115,637 bonus for an oil lease on a 637-acre tract 4¼ miles from Zach Brooks Drilling Co.'s promising well. The successful bid was submitted by Lamar Hunt, Dallas.

The bid also provided for a 19 per cent royalty on any oil produced from the lease, which is about 4 miles southwest of Citronelle.

The school board turned down Humble Oil & Refining Co.'s offer of a $227,340 bonus for the tract. The Humble offer, amounting to more than $350 per acre, was nearly double the Hunt bid. But it provided for only 12½ per cent royalty.

Drilling commitment . . . The accepted offer contained a stipulation that drilling will be started on the lease within 6 months. Failure to meet this deadline would bring a $50,000 penalty and forfeiture of the lease.

Two other major companies—Gulf Oil Corp. and Shell Oil Co.—also submitted bids for the 637-acre lease. The lowest bid reportedly amounted to slightly more than $100 per acre.

The school board also accepted a bonus bid of $13,442, or $611 per acre, for a 22-acre lease in the same area. This lease covers a tract at the Citronelle Negro school about 1 mile from the promising wildcat. Successful bidder was David K. Brooks, Houston operator. He offered a standard 12½ per cent royalty in addition to the bonus.

Last week's public lease sale gave credence to some of the reports of high prices paid in recent weeks for private leases in southwest Alabama. One major company reportedly paid $425 an acre for a lease 3 miles from the prospective producer.

The highly confident school board had invited bids for leases on several other tracts scattered through Mobile County. But all other bids were rejected, some of them ranging up to $20 an acre for tracts far removed from the Zach Brooks test.

The discovery . . . The indicated discovery, 1 Donovan, is at the northern edge of Citronelle, in the southwestern part of the state. It set off one of the state's biggest land rushes last month when it recovered oil on a drill-stem test *(The Oil and Gas Journal, August 22, page 103)*.

It recovered 1,800 ft. of oil on a test at 10,974-88 ft. In a later test through perforations in three deeper zones the well flowed 229 bbl. of fluid, 19.6 per cent salt water and mud *(The Oil and Gas Journal, September 19, page 89)*.

Tests continue . . . In the meantime, operators are starting tests in the upper of two potentially productive Rodessa zones encountered in the indicated discovery well.

A previous drill-stem test of this sand, at 10,974-88 ft., recovered 1,800 ft. of 40.5°-gravity oil with an additional 180 ft. of oil-cut mud. Retests during the week of the deeper zone, perforated in three intervals, at 11,394-11,409 ft., 11,373-79 ft., and 11,270-83 ft., got a small flow of oil with indications that water trouble, experienced in first tests, had been corrected. Following tests in the upper zone, the well will be completed dually in both sands.

Smog Suit Names Refiners

LOS ANGELES. — A civil injunction suit has been filed against nine oil companies in Los Angeles charging the firms with worsening smog conditions with refineries in the area.

Pasadena attorney P. D. Orem leveled a double-barreled blast at the industry in his suit. He asked a ban on use of catalytic cracking in refining where the process is emitting excessive amounts of pollutants into the air. Orem also sought to prohibit sale of cracked gasoline as fuel for vehicles not equipped with some device to cut down on fumes released.

First Flood in Nebraska

KIMBALL, Neb.—Nebraska's first water flood will be started soon in the Enders field, 11 miles southeast of here.

The field has been unitized under a law passed by the last legislature allowing potential production, instead of acres owned, to be used as the basis for dividing production from a field.

The Enders field, which includes two and one-half sections, was opened in 1953. Production has dwindled from approximately 3,000 bbl. a day to 1,000 bbl. and the life of the field was expected to expire in 1961. The recovery project is expected to prolong field production until 1972, with total output reaching 6,060,000 bbl., instead of 980,000 bbl.

Existing wells on the fringe of the field will be plugged and water pumped in to increase the flow from wells left in production.

Gas Rule Set

Six East Texas fields will be touched by state order

AUSTIN.—The Texas Railroad Commission last week ordered into effect October 1 a uniform method for reporting gas-well gas in six East Texas fields.

The commission found during a hearing September 6 that operators in these fields were employing at least four different methods of measuring and reporting gas volumes there.

The affected fields are Bethany, Carthage, South Hallsville, North Lansing, Waskom, and Willow Springs in Gregg, Harrison, Panola, and Rusk counties.

The new reporting rule requires:

. . . Operators of gas wells equipped with individual gas-liquid separators to report the volume of gas measured on the lease after removal of liquids by the separators.

. . . Operators of gas wells not equipped with such separators to report either the volume of the full-well stream on the lease or this volume less the calculated shrinkage that would have occurred had liquid hydrocarbons been removed by means of a lease separator.

If the operator chooses the later option, he must make a 24-hour test semiannually with a portable separator and gas meter to measure the volume of gas downstream from the separator. He then will use the ratio of the downstream volume to the full-well-stream volume as a shrinkage factor. This factor will be used until time for the next semiannual test. Such tests may be run and reported along with the other semiannual tests required by state-wide rules.

The commission declared that all gas must be reported, including that used as lease fuel or vented from low-pressure separators. Operators were warned not to deduct for removal of liquid hydrocarbons, water vapor, or impurities after the gas in question has been removed from the lease or unit.

In no event, the commission said, shall gas-well production be determined by allocating plant intake or outlet volumes to individual wells.

Offshore Neighbors

Sinclair group to drill deep Louisiana waters

NEW ORLEANS.—Drillers on Phillips Petroleum Co.'s platform 40 miles at sea soon may have some "neighbors."

Sinclair Oil & Gas Co. has applied for a permit from the Corps of Engineers to erect drilling platforms or barges in Block 175, Eugene Island area, off the Louisiana coast. The site is about 9 miles west and 3 miles north of the Phillips test in Block 184, farthest seaward of any well yet attempted in the gulf.

Sinclair is operator for a group of companies holding a joint lease on Block 175. Peoples Production Co., Sohio Oil Co., El Paso Natural Gas Co., and Western Natural Gas Co. joined Sinclair in 1954 to lease the block from the federal Government. Their bonus bid totaled $2,519,000, or a little more than $500 per acre for the 5,000-acre tract.

A representative of one of the companies said plans have been made for drilling the first well in the block in the near future. Plans call for use of a stationary platform.

Although north of the Phillips well, the acreage leased by Sinclair and associates is about the same distance from shore. It underlies water ranging from about 75 to 80 ft. in depth.

Phillips last week was drilling below 9,000 ft. at its Block 184 test. The company has reported no gas or oil shows.

Phillips was rigging up last week to start another well in the Eugene Island area. This test will be in Block 129-A, about 15 miles north of the well now being drilled. The barge to be used at that site has been returned from New Orleans where it underwent repairs. It fell while being jacked up on location several weeks ago *(The Oil and Gas Journal, August 8, page 69)*.

Warren Plans New Building

TULSA.—A 10-story building, faced completely with thermopane glass, will be built here to house Warren Petroleum Corp. headquarters.

Warren directors approved plans for the building and a lease agreement with the Warren Employes Pension Trust, which expects to begin construction in February. The company now has offices and records scattered over three buildings and a warehouse here.

Architects are Skidmore, Owings & Merrill, Chicago, designers of the Lever Brothers Building in New York, said to be the only structure faced entirely with the heat-absorber glass planned for the Warren Building. Base dimensions of the building will be 100 by 100 ft. It will be located at the corner of Boulder Avenue and Fourteenth Street near the headquarters of Kewanee Oil Co., the Independent Petroleum Association of America, and the American Association of Petroleum Geologists.

Offshore Tracts for Sale

BATON ROUGE. — Five offshore tracts are included in the acreage to be offered for oil and gas leasing by the Louisiana State Mineral Board, October 19.

C. J. Bonnecarrere, board secretary, said four of the tracts covering about 9,000 acres were nominated for leasing by Stanolind Oil & Gas Co. These tracts comprise Blocks 46 and 47 in the Ship Shoal area. Part of the acreage is in Caillou Bay, classified as inland waters.

The fifth offshore tract to be put on the auction block at the October sale is in the West Cameron area. This tract, nominated by British-American Oil Producing Co., covers about 337 acres in Block 2.

Bonnecarrere said leases also will be offered October 19 on 24 inland tracts covering several thousand acres.

The board accepted bonus bids averaging about $151 per acre for leases on 32,207 inland acres offered September 14.

Compression ratios up again . . .

. . . New Fords Have More Power

DETROIT.—Ford Motor Co. is first out with its 1956 models, and the new engines will take advantage of higher octanes produced during the past year.

Most models in the Ford, Mercury, and Lincoln cars show increases in both compression ratio and horsepower. But if they are any indication of what's to come from other manufacturers, 1956 will see nothing like the new all-out attack on gasoline octanes which had been predicted.

The new line is fairly conservative in its approach to octane requirements. The Ford line, which had one 1955 model recommended for premium, has reverted to regular-grade requirements across the board. Mercury also will produce one engine with an 8.4/1 compression ratio which will use regular.

Top Ford ratio cut . . . The top compression ratio in the Ford line is 8.4, contrasted with 8.5 last year, but the other two Ford models are stepped up. Horsepower is boosted in a new Thunderbird Y-8 engine, similar to that powering the 1955 Thunderbird, to give a top 202-hp. rating with the automatic transmission.

Both Mercury and Lincoln have moved upward in compression ratio and displacement. But the move is not likely to give either one the tops on compression ratio, since several other 1955 makes had the same 9.0/1 rating.

All three makes switched to 12-volt systems as standard.

This moderate move, with one reversion to a lower ratio and octane requirement, belies previous published guesses of sharp increases. The full facts will be known only when the other manufacturers formally announce their compression ratios.

It may be anticipated that General Motors, Chrysler, and the two independent motor companies will also move higher in octane requirements and power output. But whether the change will be as great as that brought about by the 1955 models is not yet known.

Details of the new Thunderbird and Lincoln Continental have not been announced.

HERE ARE NEW FORD ENGINE SPECIFICATIONS

	Compression ratio (/1)		Displacement (cu. in.)		Maximum horsepower	
Make and engine model—	1955	1956	1955	1956	1955	1956
Ford:						
6 Standard transmission	7.5	8.0	223	223	120 at 4,000	137 at 4,000
8 Standard transmission	7.6	8.0	272	272	162 at 4,400	173 at 4,400
8 Fordomatic	8.5	8.4	272	272	182 at 4,400	176 at 4,400
Thunderbird 8 standard transmission		8.0		292		200 at 4,600
Thunderbird 8 Fordomatic		8.4		292		202 at 4,600
Mercury:						
8 Standard transmission	7.6	8.0	292	312	188 at 4,400	210 at 4,600
8 Merc-O-Matic	8.5	9.0	292	312	198 at 4,400	225 at 4,600
8 Merc-O-Matic		8.4		312		215 at 4,600
Lincoln:						
8	8.5	9.0	341	383	225 at 4,400	285 at 4,600

Revolt Kills Oil Deal

Military forces overthrowing Peron in Argentina fiercely nationalistic, expected to oppose use of foreign capital

Paul Swain

ALL plans for oil exploration and development by major companies in Argentina headed for the shelf last week after the government of Juan D. Peron fell in an armed revolt.

The military forces in Argentina which overthrew the Peron dictatorship are known to be fiercely nationalistic. It is extremely doubtful they would look with favor on any proposal to allow outside oil capital help develop Argentina's oil.

The most vocal forces opposing Peron in the past few months accused him of giving away the country's natural resources because he invited foreign oil companies to explore in Argentina.

Sparked by failure . . . Peron himself seized control of Argentina 10 years ago and embarked on a program antagonistic to foreign investment. Only failure of Yacimientos Petroliferos Fiscales, the government oil company, to produce enough oil to meet the country's needs changed Peron's mind. He signed a contract last April with a subsidiary of Standard Oil Co. (California) which would have allowed the company to explore and develop 48,800 sq. km. in Santa Cruz *(The Oil and Gas Journal, September 5, page 85)*.

In the final days of his regime, Peron's government was trying to push approval of the contract through the Argentine Congress over opposition that mounted with every passing day.

That contract expires this week unless it is approved by Congress. With Peron out and many members of his government who pressed for this approval all seeking asylum in the embassies of foreign governments in Buenos Aires, the contract will die.

A similar fate is almost certain to befall a proposal made by Standard Oil Co. (N. J.) for exploration and development in the country. No details of the Jersey Standard offer have been made public, but it expires at the end of this year unless it is accepted. That is extremely unlikely now.

Atmosphere bad . . . Even if the military junta now in power or any succeeding government reaches the same conclusion Peron did—that the Argentine oil industry must have a transfusion of foreign capital, it would be political suicide to propose it in the nationalistic atmosphere prevailing in Argentina.

Mexico Makes Early Payment

The Mexican Government last week paid the eighth installment of $8,689,257 to the Mexican Eagle Oil Co. (Shell) and the payment was made 3 days before it was due.

Mexico expropriated the company's properties in 1938 and agreed in 1947 to pay the firm $81,250,000 in compensation, plus 3 per cent interest from March 1938 to September 1948. Payment was to be made in 15 equal annual installments on September 18. Mexico has seven more payments to make.

Burma Plant to Be Rebuilt

Work is now under way on rebuilding the Syriam refinery which processed most of Burma's oil production before it was destroyed by the British in their World War II retreat from Burma.

Initial plans are for only a fraction of the plant's prewar capacity, but its 3,500-bbl. daily distillation unit and Dubbs cracking plant will meet the country's domestic petroleum needs when combined with the output of the 3,000-bbl. topping plant at Chauk field.

The work is being done by Foster Wheeler, Ltd., on contract with Burma Oil Co. (1954), Ltd., formed last year when the Burmese Government bought a one-third interest in the industry. The remaining two-thirds of the company is held by Burmah Oil Co., Ltd.

Reports from Rangoon last week indicated that work on the crude unit and cracker has been delayed for the arrival of material from Britain, but other units are being rebuilt with equipment left at the site after the plant was destroyed.

Blaw-Knox Gets Contract

Blaw-Knox Co., New York, will supervise the building of a petrochemical plant near Puerto Cabello, Venezuela, that is expected to be producing 150,000 tons of ammonia fertilizers a year by the end of 1956.

Blaw-Knox will be in charge of the job under a contract with the Venezuelan Government. Reports from Caracas last week were that the Montecatini chemical firm of Italy will actually build the plant.

Initial output of the plant will be fertilizer based on ammonia synthesis from natural gas, but it will later produce chlorine, industrial explosives, and caustic soda.

Syria Asks Pipeline Fee Hike

THE Syrian Government last week appointed a committee of three of its ministers to press demands for a larger share of the profits from Iraq Petroleum Co., Ltd.'s pipeline system across the country.

Formation of the committee followed a public meeting in Damascus earlier this month at which the government was urged to force the pipeline to turn over 50 per cent of its net profits. Sponsored by the Executive Popular Committee for Oil Affairs, the meeting also called on the government to withdraw approval of any new pipelines unless there is a revision of transit fees paid to Syria.

The public meeting was held on the deadline set by the Syrian Parliament for an end to talks with I.P.C. that have dragged on intermittently for years. The deadline was suspended after the government resigned in an internal political dispute.

None of the crude moving through the I.P.C. system is produced in Syria. It crosses the country in pipelines from fields in Iraq. The Iraq Government recently revealed that shipments have been increased until the lines now carry about 500,000 bbl. of crude daily to Mediterranean terminals at Banias, Syria, and Tripoli, Lebanon *(The Oil and Gas Journal, September 12, page 102)*.

The boosted shipments of the system, plus plans for the new line and its additional throughput, have added fuel to Syria's demands that she share in the savings realized over the use of tankers which formerly carried the crude to Mediterranean ports.

Colombia Test Hits

Intercol-Socony wildcat rated at 200 bbl. daily

LEBRIJA 1, Colombia's latest wildcat discovery flowed 300 bbl. daily of 27.1°-gravity crude on its initial tests through a ¼-in. choke. Later tests indicated the well will produce about 200 bbl. daily.

The well was drilled by International Petroleum of Colombia, Ltd. (Jersey Standard) on acreage held by Socony Mobil Oil Co., Inc. *(The Oil and Gas Journal, September 19, page 103.)*

Spudded in July, Lebrija 1 was drilled to 6,842 ft., the depth tested last week. The operator set 5½-in. casing at 6,377 ft.

The Intercol-Socony discovery is about 12½ miles southwest of Intercol's Totumal field and east of the Magdalena River on Socony's concession No. 97. It is about 66 miles north of Barrancabermeja.

Dispute Squeezes Oil Firm

A Canadian oil company with a concession covering more than 300,000 acres in Peru last week found itself in the middle of a boundary dispute between Peru and Ecuador.

Jose R. Chiriboga, Ecuadorean Ambassador to the United States, issued a statement in Washington in which he warned stockholders of Peruvian Oil & Minerals Co. "not to count on this concession."

The Peruvian embassy countered with a statement that the company is free to go ahead and explore the 301,462-acre area. A Peruvian spokesman discounted the Ecuadorean ambassador's warning and said the territory involved belongs to Peru.

The disputed area lies between the Cenepa and Santiago rivers and is only a part of acreage held in Peru by the Canadian Oil Company. The Peruvian spokesman said the boundary between the two countries was settled by a 1942 treaty. But Ecuador has refused to join a commission actually to mark the boundary lines.

Monsanto Sets New Plant

Monsanto Chemicals will build a $1-, 500,000 plant to make phthalic anhydride at its Newport chemical plant at Monmouthshire, England.

The new plant, which will be completed by the end of 1957, will boost the company's production of this chemical raw material to about 15,000 tons a year. The company has had a plant making phthalic anhydride at Ruabon since 1936. Monsanto said last week the increased output will meet steadily rising demand from British paint and plastics industries.

Alaskan Test Drills Ahead

Anchorage Gas & Oil Development Co., Inc., has resumed drilling at a deep wildcat started 30 miles north of here last fall with a cable-tool rig.

The company has moved a 10,000-ft. rotary in on the location and is drilling ahead on the test which was sunk to 1,200 ft. with the smaller rig. The site on Anchorage Gas & Oil's 86,000-acre government lease was selected after two seasons of shallow formation test drilling and a recent geophysical survey.

Assam Gets Oilers

Two new wells located in northeastern India fields

IN spite of rampaging floods which isolated Assam from the rest of India, Assam Oil Co., Ltd. (Burmah Oil Co., Ltd.) has completed two significant producers in northeastern India.

One well, Digboi 970, in the East Kharjan area of the old Digboi field, is described as the best in the field to date. No production data were revealed by the company.

The other, Nahorkatiya 7, is the sixth producer in the new field discovered by Assam Oil about 20 miles southwest of Digboi field. It was completed at 10,350 ft. in record drilling time of 48 days. No production details were disclosed, but previously completed wells in the field have been producing about 500 bbl. daily.

The company said last week it has successfully fractured at least one well originally completed as a marginal producer in Digboi field. The treatment resulted in a "good producer."

Assam has had no rail communication with the remainder of India for more than a month. Flooding streams in northeastern India have suspended barge movements to Calcutta, but crude from Nahorkatiya field is being transported to the Assam company's 6,000 bbl. daily refinery at Digboi by a new 23-mile pipeline.

Hunts Sign $42-Million West Pakistan Exploration Deal

Nelson B. Hunt, Dallas oil man, and his wife, Caro'ine L. Hunt, will conduct a $42,000,000 search for oil in West Pakistan under two concession agreements signed in Washington. Seated, left to right, are John A. Goodson, who signed for Mrs. Hunt; Nelson B. Hunt; and Syed Amjad Ali, Pakistan ambassador to the United States. Standing, left to right, are Zahiruddin Ahmed, financial advisor to the Pakistan embassy; Samuel Nakasian, who negotiated the 60-year agreements for the Hunts; and Horace Hildreth, U. S. Ambassador to Pakistan. Hunt is the son of H. L. Hunt, president of Hunt Oil Co., Dallas. The concessions cover 20,000 sq. miles (The Oil and Gas Journal, September 19, page 102).

Boundary Parley Blows Up

British member of tribunal walks out at Geneva, protests Saudi Arabia's actions in dispute involving oil lands

AN international tribunal's efforts to settle the old dispute of boundaries between Saudi Arabia, Oman, and Abu Dhabi broke down completely last week at Geneva when the British member of the panel walked out.

The Briton, Sir Reader Bullard, a retired diplomat, resigned from the five-man tribunal and charged that Saudi Arabia has "hopelessly compromised" the entire proceedings. Sir Reader said Sheikh Yusuf Yasin, the Saudi Arabian member of the tribunal, represents the Saudi Arabian Government instead of acting as an "impartial arbitrator."

The boundary dispute has been going on for years, but in the past nothing much has been at stake except the ruffled feelings of the rival sheikhs. The area involved is a good part of Rub al Khali desert, known as the "Empty Quarter." It's a vast expanse of wind-blown sand and little else. But now oil has made a difference.

Cities Service Co. and Richfield Oil Corp. are drilling a wildcat in Dhofar, to the south of the disputed area, and Petroleum Development (Oman), Ltd., an affiliate of Iraq Petroleum, is getting ready to drill at Jebel Fahud, west of Muscat.

Since 1935, the Saudi Arabians have been accused of trying to extend their boundaries eastward into the territory of Oman and Abu Dhabi. It all came to a head about 3 years ago after Saudi tribesmen made an armed foray into the Buraimi oasis which lies in the disputed area. Then the Saudi Government and the British, acting for the ruler of Abu Dhabi and the Sultan of Muscat, agreed to submit the dispute to an international tribunal. Last week's meeting of the short-lived tribunal was the result.

Just what will happen now was not clear in Geneva last week. The British approached the meeting of the tribunal with repeated charges that the Saudis were offering large bribes to win over local rulers and sheikhs to their side. Since the British member of the tribunal resigned the proceedings have been suspended. The tribunal's president, Charles de Visscher, a Belgian and a judge of the International Court of Justice, failed to say when the sessions will be resumed.

Italian Monopoly Finds Oil

ITALY'S government-controlled oil company, Ente Nazionale Idrocarburante, has apparently made its first oil discovery outside northern Italy's Po Valley, the government's monopoly area.

Premier Antonio Segni announced in Rome last week that the government company has an oil strike at Vallecupa, on the Pescara River, about 20 miles inland from the Adriatic Coast. The well is only 2 miles from a discovery drilled by Petrosud, S.A. (Gulf and Montecatini) which is still shut in.

Premier Segni gave no details of the strike except to say that oil sands were encountered at 1,600 ft. He added that the well is being deepened in an effort to find other producing formations.

The first well drilled by the company formed by Gulf and the Italian Montecatini chemical interests made its discovery near Alanne at 2,560 ft. The well, Cigno 1, tested about 2,000 bbl. daily of 34° crude from a limestone formation of considerable thickness. It is only a few miles from a well drilled by Azienda Generale Italini Petroli, the over-all government company, which yielded no production. Cigno 2, spudded 1,650 ft. to the north of the discovery, was started in March and scheduled to go deeper than the first well.

The Petrosud discovery is still shut in because the company has no exploitation concession from the government. The new premier promised in his statement of policy to the Italian Parliament last month that he would submit "without delay" a bill to regulate the country's oil development *(The Oil and Gas Journal, September 5, page 87).*

Petrochem Unit Operating

Shell Chemical Co.'s new $2,000,000 epoxide plant at the Stanlow, England, refinery went into operation last week.

The plant will produce 2,000 tons a year of seven different grades of epoxide resins for use in surface coatings. The resins are amber liquids or solids made by reacting diphenylol propane with epichlorohydrin in the presence of a caustic-soda solution.

Canadian Briefs

DAWSON CREEK, B. C.—A new 2,500-bbl. per day refinery being built here by X-L Refineries, Ltd., will feature a 500-bbl. per day Houdriforming unit, licensed by Houdry Process Corp. The plant, engineered by Koch Engineering Co., Inc., of Wichita, Kans., is being constructed by B. D. Bohna & Co. of Vancouver, B. C., and E. V. Lane Corp. of Palo Alto, Calif., under a joint contract. The Houdriformer, equipped with a guard case for pretreating the straightrun naphtha charge stock, will be on stream before January 1.

REGINA. — Saskatchewan's sale of crown drilling reservation rights on 33,440 acres returned the government $580,113 in rental fees and cash bonuses. Canadian Gulf Oil Co. paid the top price of $188,979 for 2,960 acres 3 miles northeast of Steelman field. Other bids included Montreal Trust, $177,907 for 3,200 acres 15 miles southeast of Frobisher production; Imperial Oil, Ltd., $163,197 for 5,280 acres 4 miles north of Frobisher production; and Royalite Oil Co., Ltd., $50,050 for 19,920 acres 22 miles east and north of Coleville field.

JASPER, Alta. — Alberta's growing natural-gas reserves are calculated to be 15.6 trillion cubic feet, as of June 30. The estimate was announced by D. R. Goodall, deputy chairman of the Alberta Petroleum and Natural Gas Conservation Board, before the Independent Natural Gas Association of America meeting here. The figure compares with 13.4 trillion cubic feet estimated for Alberta March 31, 1954. Reserves for all of western Canada are set at more than 21 trillion cubic feet.

WINNIPEG.—A new tariff of 18 cents per barrel—representing a 2-cent reduction—will go in effect October 1 on the line operated by Trans-Prairie Pipelines, Ltd., serving North Virden and Virden-Roselea fields in southwestern Manitoba. A 2-cent cut also was made in June. The Trans-Prairie system ties into the Interprovincial pipeline near Cromer, Manitoba. The new rate in effect boosts the net wellhead crude price received by the producer to $2.285 per barrel.

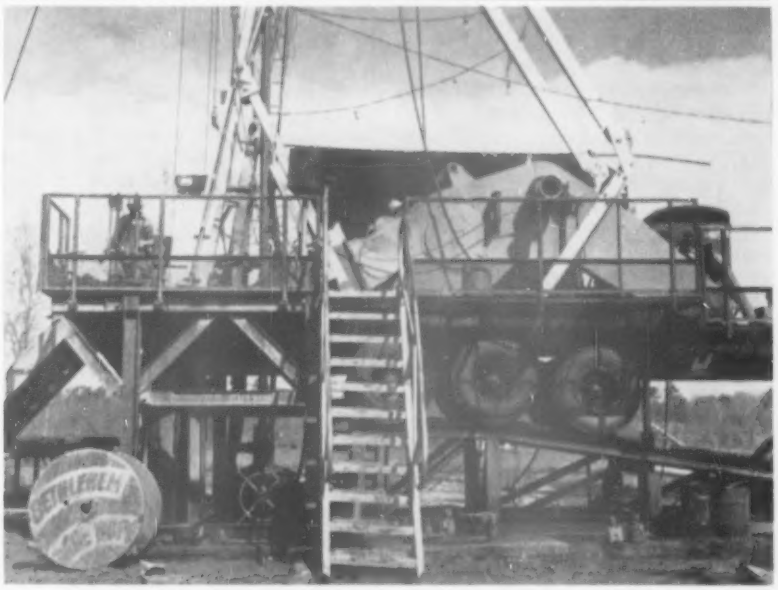
TORONTO. — Great Sweet Grass Oils, Ltd., has acquired more than 20,000 acres covering about 30 sq. miles in the St. Lawrence Lowlands area of Quebec, located midway between Montreal and Quebec City. The firm plans to drill eight wells in the tract.

Woolf & Magee show how

Slim Holers Compete With Big Rigs

through wide depth range

by James W. Arnold



Moving operations are speeded up with the use of a trailer-mounted slim-hole rig (above). Photo at left shows one of Woolf & Magee's slim-hole units making hole.

THE ability to take a small portable rig and make it drill competitively through a wide depth range is one of the brightest aspects of slim-hole drilling.

Maximum depth to date for Woolf & Magee's 34 slim holes has been an 8,000-ft. 4¾-in. hole drilled in Wilkinson County, Mississippi. This particular well was reamed to 7,516 ft. and completed with 5½-in. casing. The setting of 5½-in. casing at this depth represents an overload of this size rig and is not recommended; however, we do not feel that the rig's drilling capacity has been reached at 8,000 ft.

Favorable comparison . . . As shown in Tables 1-4 and Figs. 1-4* the penetration rates, drilling time, and bit cost of the slim holes compare favorably with the conventional hole sizes from 7⅞ to 9 in. Particular attention is called to Table 2 and Fig. 2 containing summaries of four wells drilled in Catahoula Parish, Louisiana. An interesting comparison between two 4¾-in. and two 6½-in. holes in La Salle Parish is shown in Table 1 and Fig. 1. While the 6⅛-in. hole does not show any marked advantage over the 4¾-in. hole in penetration rates, the 50 per cent reduction in the number of rock bits used and the resultant saving in trip time tend to favor the 6⅛-in. hole. While penetration rates might be increased by increasing the size hole beyond 6⅛ in., using larger pumps and larger drill pipe, it is doubtful that these changes would bring about any reduction in the cost per foot of hole drilled.

Tables 3 and 4 and Figs. 3 and 4 compare slim holes to conventional holes in Adams County, Mississippi, and Webster Parish, Louisiana.

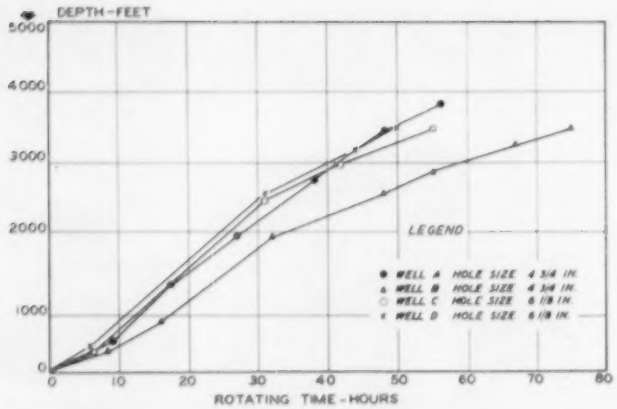
Economics encouraging . . . The economics of the slim hole in Wilcox drilling has been most encouraging. Costs of looking at the sand have been decreased an average of 15-20 per cent depending on the area and depth of the hole. Where production has been encountered and hole has been reamed, the total cost compares favorably with a regular-size hole. Of course, accessibility and number of locations strongly influence savings to be gained. Portability, smaller capital investment, reduced trucking, and daily operating expense—all are important factors in reducing the cost of slim-hole drilling.

The determination of the most economical hole size for different areas and different depths will follow continued slim-hole activity. Improved equipment and drilling technique should make the slim hole even more attractive as the drilling industry explores this cost-cutting tool.

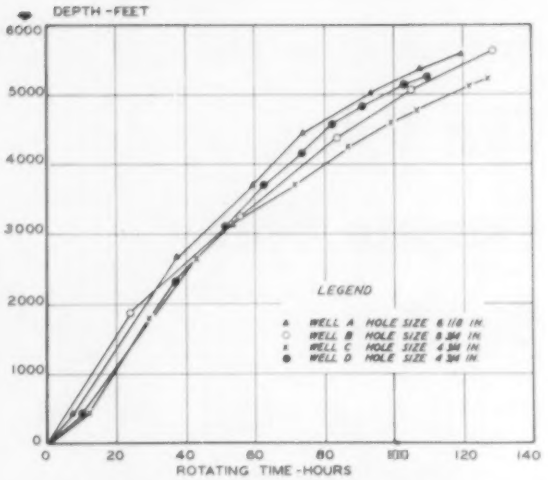
Woolf & Magee's faith in the future of slim-hole work is evidenced by the fact that the firm now owns and operates three of these rigs in Louisiana and Mississippi.

Background . . . Woolf & Magee en-

*Figures and tables are keyed together. Fig. 1 and Table 1 contain information about the same wells, Fig. 2 and Table 2 and so on.



COMPARISON OF SLIM HOLES in LaSalle Parish, Louisiana. Fig. 1.



COMPARISON OF SLIM HOLES in Catahoula Parish, Louisiana. Notice that Well B is an 8¾-in. hole. Fig. 2.

TABLE 1—COMPARISON OF 6⅛ AND 4¾-IN. SLIM HOLES, LA SALLE PARISH, LOUISIANA

Well	Hole size (in.)	Depth interval (ft.)	Type drilling	Normal hours drilling and trip time	Normal, ft./hr.	Hours drilled	No. bits	Average ft./bit	Average ft./hr.	Average hr./bit	Bit, Cost/hr.	Type rig
A	4¾	0-3,810	Soft	65	58.6	57	5	762	66.8	11.4	0.17	Slim-hole
B	4¾	0-3,510	Soft	85	41.3	75	6	585	58.5	12.5	0.22	Slim-hole
C	6⅛	0-3,504	Soft	60	58.4	55	3	1,168	63.7	18.3	0.13	Slim-hole
D	6⅛	0-3,509	Soft	55	63.8	50	3	1,170	70.2	16.7	0.13	Slim-hole

TABLE 2—COMPARISON OF 9-IN. CONVENTIONAL HOLE WITH 6⅛ AND 4¾-IN. SLIM HOLES, CATAHOULA PARISH, LOUISIANA

Well	Hole size (in.)	Depth interval (ft.)	Type drilling	Normal hours drilling and trip time	Normal, ft./hr.	Hours drilled	No. bits	Average ft./bit	Average ft./hr.	Average hr./bit	Bit, Cost/hr.	Type rig
A	6⅛	0-5,600	Soft	134	41.8	120	6	933	46.7	20.0	0.16	Slim-hole
B	9	0-5,655	Soft	139	40.7	129	5	1,131	43.8	25.8	0.18	7,500-ft. power
C	4¾	0-5,212	Soft	147	35.5	127	9	579	41.0	14.1	0.22	Slim-hole
D	4¾	0-5,265	Soft	127	41.5	110	8	658	47.9	13.8	0.13	Slim-hole

tered the slim-hole-drilling picture in September 1953 with the drilling of two 4¾-in. test holes in Caldwell Parish, Louisiana, using a 600-hp. rig. From the results of these tests, Woolf & Magee assembled its first slim-hole rig in April 1954. Following the successful operation of this rig, two more slim-hole rigs were purchased and placed in operation—one in November 1954 and the other in May 1955. Since placing the first slim-hole rig in operation, the firm has drilled a total of 34 slim holes (4¾ and 6⅛-in.) with a total footage drilled in excess of 200,000 ft. (Table 5).

Our initial objective in exploring slim-hole drilling was to find a cheaper and more efficient method to drill wells in the Wilcox trend in eastern Louisiana and western Mississippi. In setting up operations for slim-hole drilling a number of items had to be considered—availability of logging and testing equipment, practicability of reaming slim holes and setting casing, and above all, the over-all cost picture. All of the foregoing items had to be answered before the operators' acceptance of the slim-hole idea could become a reality.

The original plan for our slim-hole operations called for drilling a 4¾-in. hole under 7-in. o.d. surface casing. In case production was encountered this plan called for reaming of the 4¾-in. hole to 6⅛ in., setting 4½-in. o.d. casing and running 2-in. tubing. Three wells were drilled following the above program; two were dry holes and the third was reamed and completed with 4½-in. o.d. casing and 2-in. tubing with good results.

Drilling program . . . The slim-hole program was changed on the fourth well to allow the setting of 5½-in. o.d. casing. Since Wilcox wells characteristically produce large quantities of water with the oil, operators require 2⅞-in. tubing in completing the wells. The 2⅞-in. tubing in turn requires 5½-in. o.d. casing for sufficient clearance. To fit this demand, it was decided to set 8⅝-in. for surface casing, drill a 4¾-in. hole and, in the event production was found, to ream the 4¾-in. hole to 7⅞-in. and set 5½-in. o.d. production string. We have also used this same general program in drilling five slim holes out of the Wilcox area in Webster and Natchitoches parishes. In the past 3 months, the program was altered slightly in several instances by drilling a 6⅛-in. hole instead of 4¾-in. in an effort to determine the most economical size hole in drilling the Wilcox and also the harder formations of the Natchitoches Parish area.

Further experiments into various hole sizes are now being carried on in

THE AUTHOR

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Sabine Parish, Louisiana, where a 5⅝-in. hole is being drilled.

Table 5 lists the wells drilled by our three slim-hole rigs through July 31, 1955.

TABLE 5—TOTAL FOOTAGE

Hole size (in.)—	Drilled (ft.)	Reamed (ft.)
4¾	167,391	
6⅛	34,680	
4¾ reamed to 6¼ or 6⅛		9,431
4¾ reamed to 7⅞		42,677
All other holes (7⅞ and 9)	12,490	
Total footage, July 31, 1955	214,561	52,108

Rigs and Rig Equipment

Rig. No. 10 has the draw works mounted on dual-axle tandem trailer equipped with 94-ft. cantilever mast. Draw works is powered by an engine driving through a torque converter. Substructure is 5 ft. 8 in. high. Swivel is rated at 60 tons capacity while the unitized traveling block and hook is rated at 100 tons. Rotary is powered by draw-works engine. Woolf & Magee uses one 8-in. 2,000-lb. w.p. chain-drive blowout preventer. One 7¼ by 12-in. pump is skid mounted with an engine equipped with torque-converter drive. Pump has an oil bath chain drive from torque converter.

Rigs No. 11 and 12 have draw works mounted on triple-axle tandem trailer equipped with 94-ft. cantilever mast. Draw works is powered by an engine driving through a torque converter. Substructure is 8 ft. 8 in. high. Swivel is rated at 60 tons, traveling block and unitized hook are rated at 100 tons. Rotary is powered by draw-works engine. One 8-in. 2,000-lb. w.p. chain-drive blowout preventer is used. One 7¼ by 12-in. power pump is skid mounted with an engine equipped with torque-converter drive with oil-bath chain drive from converter to pump.

Each unit has air clutches throughout, with the mud pumps being air controlled from driller's position. Each pump also has air-controlled inertia brake. Rigs Nos. 11 and 12 are equipped with 15-in. double-rotor hydromatic brakes.

While these three slim-hole rigs are in the 4,000-5,000-ft. class with 4½-in. drill pipe, we have drilled one 4¾-in. hole to 8,000 ft. using 2⅞-in. o.d. drill pipe. At present we do not feel we have reached the rig's drilling capacity at 8,000 ft. The use of tubing for drill pipe would also tend to extend the drilling range by improving the hydraulic and weight problems.

Rig and drill pipe may be moved in eight truck loads for location moves where roads are in good condition and weather conditions permit. On long moves over highways, truck loads vary between 10 and 12, depending upon the location.

Drill Pipe and Drill Collars

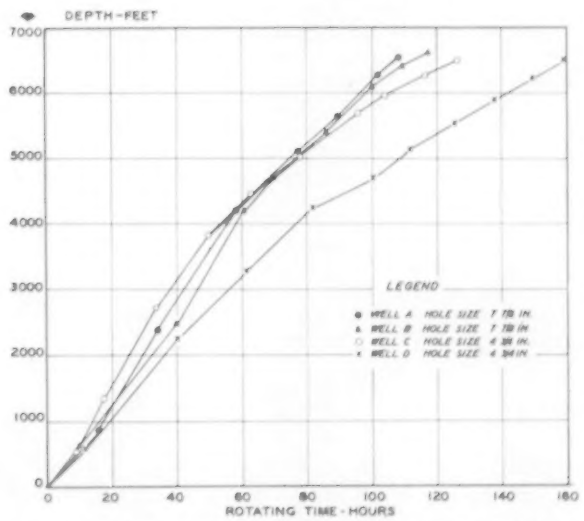
Two of the rigs have 6,500-ft. strings of 2⅞-in. o.d. 10.40-lb. drill pipe with 4⅛ by 2⅛-in Flashweld tool joints. Tool joints have three bands of hard-face material on box. Each string of

TABLE 3—COMPARISON OF TWO 7⅞-IN. HOLES WITH TWO 4¾-IN. HOLES, ADAMS COUNTY, MISSISSIPPI

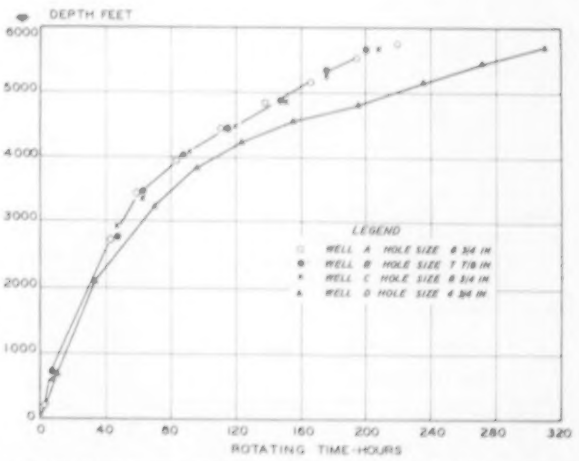
Well	Hole size (in.)	Depth interval (ft.)	Type drilling	Normal hours drilling and trip time	Normal, ft./hr.	Hours drilled	No. bits	Average ft./bit	Average ft./hr.	Average hr./bit	Bit, Cost/hr.	Type rig
A	7⅞	0-6,555	Soft	126	52.0	109	6	1,093	60.1	18.2	0.16	500-hp.
B	7⅞	0-6,627	Soft	141	47.0	118	7	947	56.2	16.9	0.19	500-hp.
C	4¾	0-6,510	Soft	152	42.8	126	9	723	51.7	14.0	0.18	Slim-hole
D	4¾	0-6,492	Soft	189	34.3	160	9	721	40.6	17.8	0.18	Slim-hole

TABLE 4—COMPARISON OF THREE CONVENTIONAL HOLES WITH 4¾-IN. SLIM HOLE, COTTON VALLEY FIELD, WEBSTER PARISH, LOUISIANA

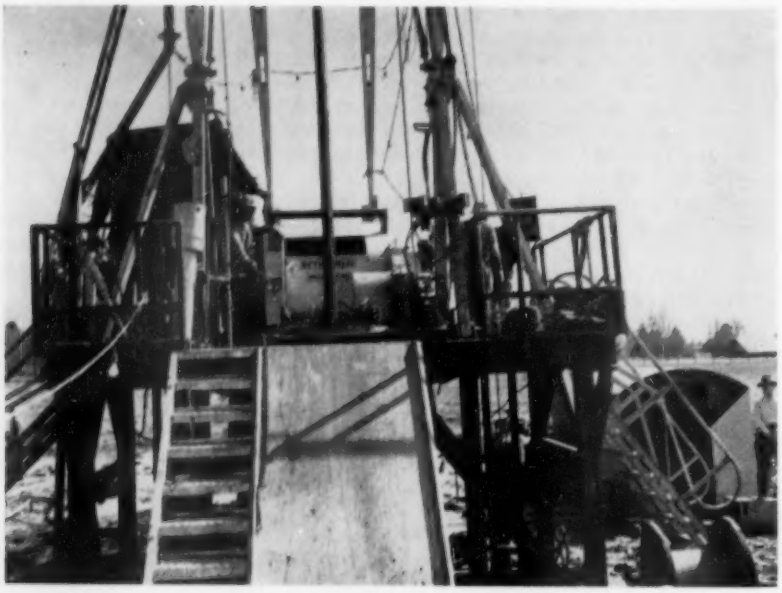
Well	Hole size (in.)	Depth interval (ft.)	Type drilling	Normal hours drilling and trip time	Normal, ft./hr.	Hours drilled	No. bits	Average ft./bit	Average ft./hr.	Average hr./bit	Bit, Cost/hr.	Type rig
A	8¾	0-5,740	Med. hard	241	23.8	218	8	718	26.3	27.3	0.28	900-hp.
B	7⅞	0-5,680	Med. hard	220	25.8	200	7	811	28.4	28.6	0.22	700-hp.
C	8¾	0-5,670	Med. hard	226	25.1	206	7	810	27.5	29.4	0.25	900-hp.
D	4¾	0-5,739	Med. hard	356	16.1	303	18	319	18.9	16.8	0.41	Slim-hole



COMPARISON OF SLIM HOLES in Adams County, Mississippi. Fig. 3.



COMPARISON OF SLIM HOLES in Webster Parish, Louisiana. Fig. 4.



Woolf & Magee are now operating three slim-hole rigs in Louisiana and Mississippi, and the performance to date has been very satisfactory.

drill pipe is complemented by six 4⅛ by 2⅛-in. by 30-ft. drill collars.

The other rig has an 8,000-ft. string of 2⅞-in. o.d. 6.50-lb. N-80 tubing with 4⅛ by 2⅛-in. bucked-on tool joints. Tubing is equipped with eight 4⅛ by 2⅛-in. by 30-ft. drill collars in an attempt to keep the tubing string in tension while drilling.

The first string of 2⅞-in. drill pipe was placed in service in July 1954 and since that date has drilled and reamed more than 160,000 ft. of hole. This pipe is in excellent condition with no appreciable wear on the tool joints. The second string of drill pipe was placed in service in January 1955 and has drilled and reamed more than 60,000 ft. of hole. This string, too, is in excellent condition. The string of 2⅞-in. tubing now has 13,000 ft. of hole to its credit on two wells drilled and is now on its third well. Tubing was selected for the third string of pipe after reports from various companies reported good results in using it for drilling operations. Lower initial cost, better hydraulic features, and weight reduction make the use of tubing attractive if it is able to withstand the rough treatment encountered in drilling operations.

Coring, Testing, Logging

● **Diamond coring.** Fairly good results have been obtained; however, most of coring in Wilcox is done by side-wall coring method. Diamond coring has been done with 4⅛ by 2⅛-in. 60-ft. core barrel with 4⅛ by 2⅛-in. head.

● **Side-wall coring.** Percussion cores are taken by Schlumberger with good results. Some difficulty has been experienced in 4¾-in. hole with gun sticking and losing cores.

● **Drill-stem tests.** Good results were experienced with the small number which have been made.

● **Electrical log.** Good results are the rule with only minor difficulties in running log in 4¾-in. hole.

● **Induction log.** Service company prefers at least a 5⅝-in. hole but will run logs in 4¾-in. hole if operator assumes risk.

The 4¾-in. hole can be cored, logged, and tested as stated above—whether a 5⅝ or 6⅛-in. hole would eliminate the difficulties noted and be as cheap as the 4¾-in. hole will have to be determined by additional drilling.

Fishing

Our slim-hole drilling program has not escaped trouble—drill pipe has been stuck on four occasions. Each time the trouble has been traced to a lapse in good operating practices. Spotting crude oil and lubricating pipe till it loosens has been the answer to all of our stuck-pipe problems.

Reaming and Completion

Of the nine slim holes which have been reamed and completed, seven have been reamed from 4¾ to 7⅞-in. while two wells have been reamed to 6⅛-in. Experience has shown that a 6⅛-in. hole might be drilled more economically than a 4¾-in. hole can be reamed to 6⅛-in.

A total of 42,677 ft. of hole has been reamed with a total of twenty-three 7⅞-in. bits for an average of 1,856 ft. per bit. Jet bits are used in reaming operations since the fluid is directed to the shoulder of the hole which is being drilled.

Hole Size and Hydraulics

The majority of our slim holes to date have been 4¾-in.—27 wells and 167,391 ft. as against 7 wells and 34,670 ft. for 6⅛-in. holes. Although only a limited number of 6⅛-in. holes have been drilled it appears that this size hole might prove more economical than the 4¾-in. hole in shallow drilling. The 5⅝-in. hole might well prove to be a popular slim-hole bit since it has better bearing than the 4¾-in. bit and it will not require the weight nor the circulation rate required by the 6⅛-in. bit.

Circulating rates, annular velocities, pressures, and jet velocities are listed in Table 6. The 12-in. pumps were dressed with 4¼-in. liners while drilling the 4¾-in. hole and 4¾-in. liners while drilling the 6⅛-in. holes.

As noted in the chart, the minimum annular velocity in the 6⅛-in. hole was 130 ft. per minute while the average is only 150 ft. per minute. The reason for this lies in the relatively large annular area in drilling the 6⅛-in. hole using 2⅞-in. drill pipe and the higher pressure losses encountered in trying to pump any appreciable volumes through the 2⅛-in. i.d. drill pipe.

No attempt has yet been made to determine the effect of jet velocity on penetration rates or maximum and minimum circulation requirements for the various size holes. Under all hole conditions we have tried to circulate the maximum volume of fluid for each bit and jet size without overloading of the mud pump.

TABLE 6

Data on mud system—	Hole (in.)	Maximum	Minimum	Average
Circulation rates, g.p.m.	6⅛	305	154	172
Circulation rates, g.p.m.	4¾	205	115	142
Annular velocities, ft. per min.	6⅛	260	130	150
Annular velocities, ft. per min.	4¾	355	195	242
Jet velocities, ft. per second (¼-in. jets)	4¾	410	250	308
Jet velocities, ft. per second (⅞-in. jets)	4¾	285	170	196
Pressures, psi.	6⅛	1,300	750	1,050
Pressures, psi.	4¾	1,400	850	1,100

Let's Look at the Economics of Slim Holes

Mobil did, and came up with some figures different from those of earlier drilling

by F. M. J. Valint
Mobil Oil of Canada, Ltd.

ADVANTAGES of the slim hole are as follows: (1) less transportation cost, (2) cheaper surface-casing program, (3) less cost for cement to abandon, (4) smaller mud cost.

Disadvantages of slim holes are: (1) slower rate of bit penetration, (2) in case of trouble, fishing is difficult, (3) more prone to blowouts due to small mud volume in circulation system, (4) completion costs are far greater in case oil shows are encountered due to the necessity for reaming, (5) more costs for company drilling, geological, and engineering supervision due to greater length of time occupied on the hole.

When Ohio Oil Co. successfully completed some 4¾-in. slim holes to the depths of 4,500 ft., there was a lot of publicity of this new and economical way of drilling wildcat wells. The natural reactions were to try the same method to evaluate the feasibility and the economics of this type of drilling, which was gaining popularity. Socony-Vacuum Oil Co. of Canada embarked on a 10-well slim-hole program. Four holes were drilled in the North Regina area, two holes in the Fosterton (western Saskatchewan) area, and the last four holes in the D'Arcy block (west central Saskatchewan).

This paper was originally presented before the Canadian Association of Oilwell Drilling Contractors.

We believe these 10 holes, almost without exception, cost more than a conventional 9-in. hole, but then we had no convenient yardstick to check this assumption and some assumptions had to be made. One of the main contentions was that it is hardly fair to compare, say, a rig which is rated 6,000-ft. depth with 4½-in. drill pipe to a slim-hole "seismic type" rig rated to 3,700 ft. with 2⅜-in. drill tubing.

In the earlier experiments we used two contractors. We concluded, however, that it would be advantageous to use our own No. 2 rig which is a service rig converted to a light drilling rig. By having our own rig, we could keep a much closer control over the operations; therefore, the comparison should be more acceptable.

It was decided to drill the three holes in different sizes, namely 4¾, 5⅝, and 6¾-in. The locations of the first two holes were fairly close together and geologically more or less at the same subsea elevation; therefore, we could assume that conditions were similar and a more accurate picture could be presented.

Comparison . . . For a proper evaluation, the economics of the slim hole were compared to a 9-in. hole drilled by our own No. 1 rig in the same general

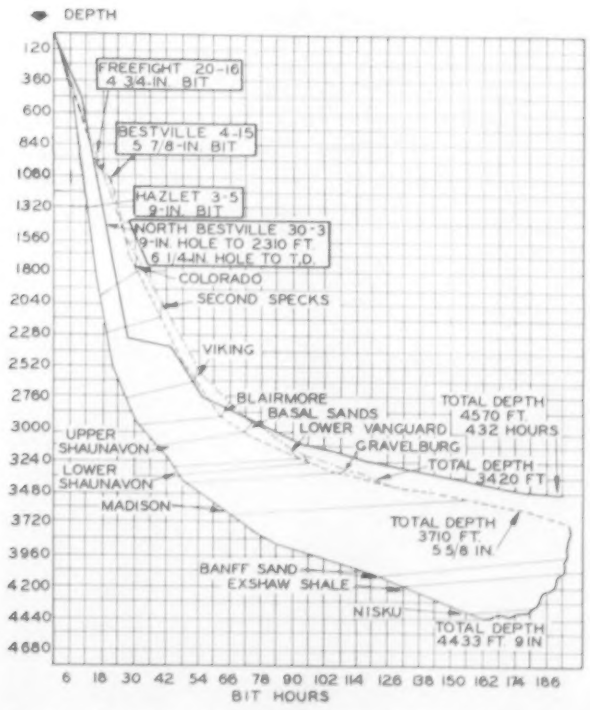


Fig. 1A—Comparison of bit hours between slim holes and conventional 9-in. North Bestville 30-3 was combination 9-in. and slim hole.

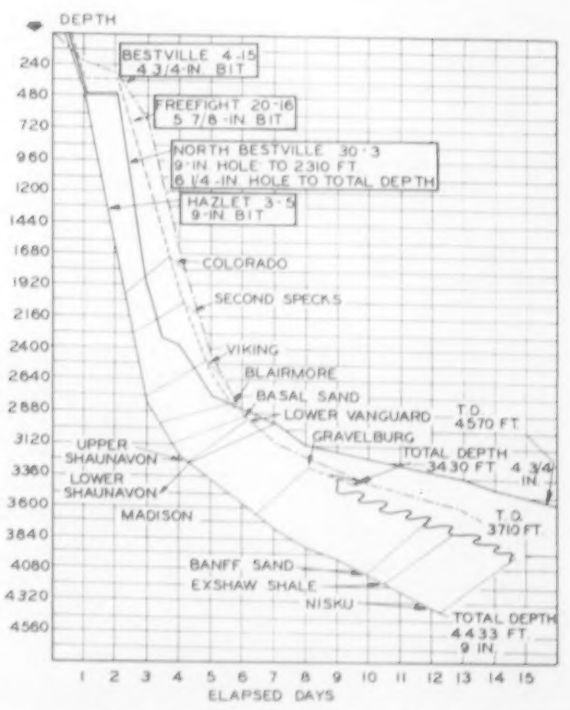


Fig. 1B—Although the daily cost of drilling a 9-in. hole is greater than the slim-hole cost, the conventional hole can be drilled faster.

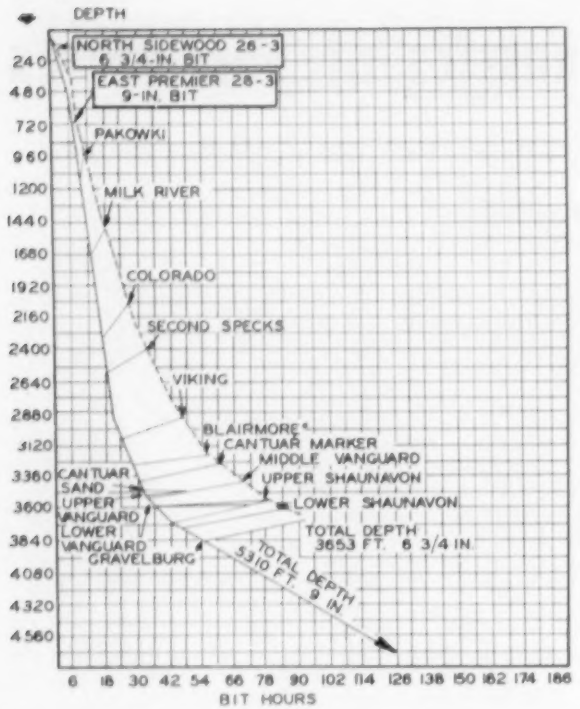


Fig. 2A—Drilling-time comparison between a 9-in. and a 6¾-in. hole, showing hours on bottom.

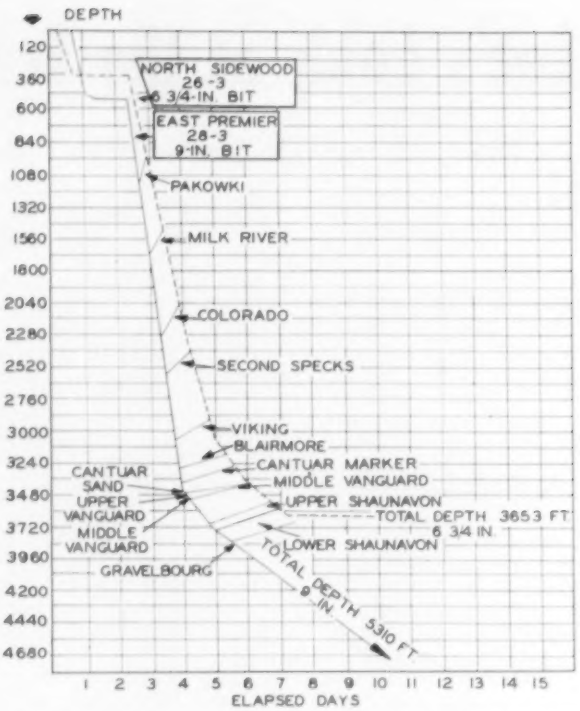


Fig. 2B—The 9-in. hole reached 3,653 ft. in about 2½ days less time than the slim hole.

area as the slim holes were being drilled. As our No. 1 rig is also a trailer-mounted rig, having a 6,000-ft. depth rating, it is a suitable comparison.

This presentation is based on the performance of these two rigs in various size holes.

Slim hole . . . The first hole was drilled at 4-15 South Bestville with 5⅝-in. bits, using 2⅞-in. 4140 steel drill tubing with Hydril modified i.f. Flashweld tool joints. Although the water was rather alkaline, little difficulty was experienced with mud and practically

TABLE 1—CIRCULATING RATES

	Size hole, in.			
	4¾	5⅝	6¾	9
Circulating rate, g.p.m.	150	180	240	485
Annular velocity between hole and D.P., ft./min.	250	190	175	200
Nozzle velocity, ft./sec.	208	249/192	197	207

TABLE 2—COST COMPARISON

	Slim hole S. Bestville	Slim hole Freefight	Conventional Hazlet	Slim hole N. Sidewood	Conventional E. Premier
Total depth	3,710	3,410	4,433	3,653	5,310
Comparable depth	3,710	3,410	3,710	2,653	3,800
Size of hole, in.	5⅝	4¾	9	6¾	9
Total drilling cost	14,947.44	11,798.26	19,013.86	10,525.77	30,573.35
Drilling cost to comp. depth	14,947.44	11,798.26	11,725.20	10,525.77	10,542.50
Cost/ft. T.D.	4.03	3.46	4.29	2.88	5.75
Cost/ft. C.D.	4.03	3.46	3.16	2.88	2.77
Cost/day	786.70	842.73	1,267.59	877.14	1,054.25

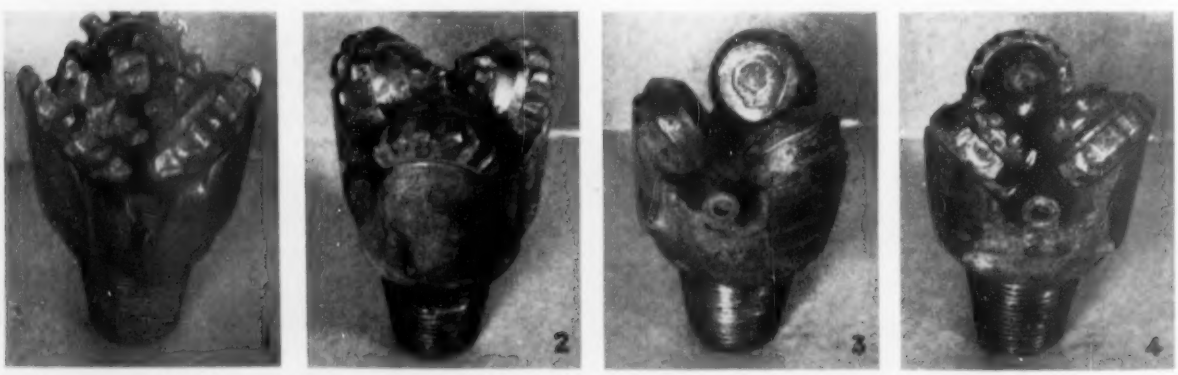


Fig. 3—Jet bits outdrilled conventional bits under similar conditions. Nozzles on bits 1 and 2 wore out in a short time. Bit 3 was in poor condition when pulled; bit 4 was pulled at about the right time.

none with the hole except on the surface, where we ran into gravel beds and it took longer than anticipated. Unfortunately, some of the bits did not arrive in time to alternate them as we had intended, in order to form a better opinion of their quality. Naturally, this hole was a little slower than expected as we had to use five conventional bits instead of jets, as planned.

The second hole, 20-16 Freefight, was drilled 4¾ in. The crews were then used to the drill tubing and showed a better round-trip time than on the previous hole. Also, various types of bits were on hand and a better pattern was established. The hole progressed satisfactorily and no difficulty was encountered throughout.

The fastest hole was made on North Sidewood with 6¾-in. bits and 3½-in. i.f. drill pipe; again, no trouble was experienced with the hole.

The first two holes have been compared to 3-5 Hazlett which was drilled 9 in. to the Nisku (D-3) formation relatively close to the above holes. And the last of the slim holes, 6¾-in., was compared to 28-3 East Premier in comparable formation and drilled 9 in.

Locations, moving, and rigging up . . . Preparation of locations for both rigs was simple and required little effort; costs were usually of the same order; if anything, No. 2 rig locations are a little more expensive than those of No. 1 rig. This is due to the fact that No. 1 uses a steel mud tank while No. 2 uses a pit.

In moving costs, the smaller rig has a slight advantage due to the number of loads moving, usually about 8-9 which No. 1 rig is usually about 13-14. Therefore, the difference is five loads; about $3 per mile.

Rigging-up time is usually 2 hours longer on No. 1 rig or say, $70 difference.

Penetration . . . As already stated, to the same depth and formation, the 9-in. hole was almost 100 per cent faster than the slim hole. This is well substantiated by the two graphs presented here, Fig. 1 showing South Bestville and Freefight wells, both slim holes, 5⅝-in. and 4¾-in., against 3-5 Hazlet wells, a 9-in. hole. Fig. 2A shows North Sidewood, 6¾-in. hole against 28-2 East Premier, a 9-in. hole.

This confirmed the previous findings, although the comparison is better, as we had our own rigs on these holes and a Martin-Decker rate of penetration recorder. Holes are compared down to the same formation—the Madison 4¾, 5⅝, 9-in., and the Gravelbourg, 6¾, 9-in.

Bits . . . Various types of bits were tried, namely two-way jet drag, three-cone jets, three-cone conventional, and single-cone conventional.

The two-way jet drag bit had the highest rate of penetration in the soft top hole, but, unfortunately, these bits do not stand up to the sand stringers encountered and therefore their effectiveness is cut down.

Two single-cone-type bits were tried but the cone and nozzles were too soft; the penetration was very poor.

One make of three-cone rock jet bit was not economical, as the nozzles were too soft and washed out in very short time, although the bearings were better than in all other makes and types (No. 1-2). (See pictures, Fig. 3.)

The other make of three-cone jet bit was the only one that performed constantly and well, although some of these were in dangerous condition (No. 3); most were pulled at just about the right intervals (No. 4).

Jet bits outdrilled the conventional bits.

Circulating rates . . . The circulating rates for various size holes are tabulated in Table 1.

Testing and logging . . . We have to state here that slim holes can be drilled with no difficulty and testing and logging can be accomplished without any trouble. As of this date, we have drilled 13 slim holes with no difficulty, as far as testing is concerned.

Drilling-cost comparison . . . To obtain a drilling-cost comparison between different rigs and hole sizes, a time basis should be used to evaluate the cost fairly. On this basis, the cost of slim holes drilled up to the present time is the same as a 9-in. hole and, in some cases, even more.

To present a fair picture, we have plotted the total number of days on the well against depth. The costs are tabulated in Table 2.

If we take the actual per day cost, and apply it against the attached graphs, we soon see that the 9-in. holes, although they cost more per day, are cheaper in over-all cost. Of course, it should be borne in mind that this is not necessarily true in all formations, although it is in western Saskatchewan to the depths given. For instance, let us check on Fig. 1B. It shows that the 9-in. hole reached a depth of 3,520 ft. in 4.25 elapsed days at $1,054.25 per day, or a total cost of $4,480.56, while the 6¾-in. hole reached the same formation at a depth of 3,408 ft. in 6 days at $887.14, or a total cost of $5,262.84. Difference: $782.28.

Cost of surface equipment . . . If we set 6⅝-in. surface casing, the cost difference would be greater, but then the possibility of enlarging the hole would be nil. Therefore, we consider the cost under the above basis, as a fair comparison. (See Table 3.)

TABLE 3—SURFACE EQUIPMENT

	10¾ in.		8⅝ in.
350 ft. casing	$1,225.00	350	$1,071.00
Five centralizers at $44.60	233.00	at 38.50	192.50
Four 5-ft. scratchers at $11.80	47.20	at 11.80	47.20
200 sacks cement at $1.55	310.00	120 sacks	187.55
Cementing services	180.00		180.00
Guide shoe	46.02		37.65
Float collar	72.33		63.76
Total	$2,103.55		$1,779.66

Difference: $323.89.

Summary

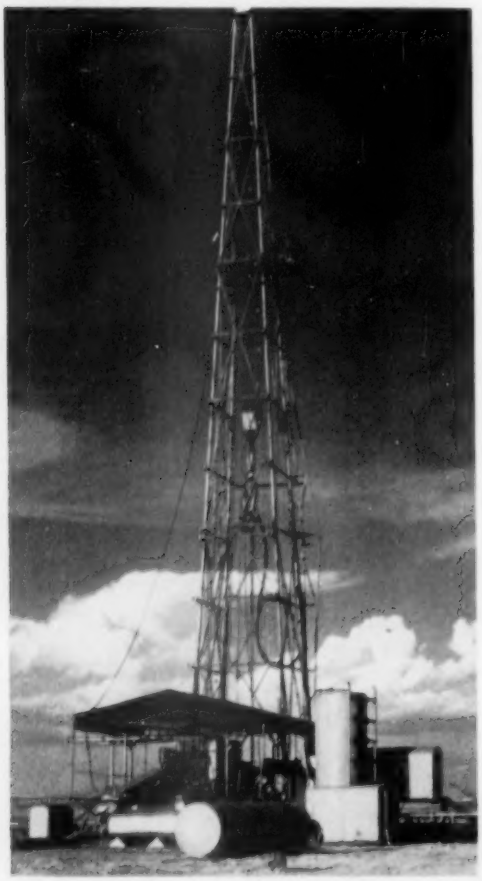
1. From our experiments with slim holes, we are in a position to state that, in soft formations and at 3,000-4,000-ft. depths, such as encountered in western Saskatchewan, the slim holes do not offer any advantage costwise.

2. The smaller the bit, the slower the penetration.

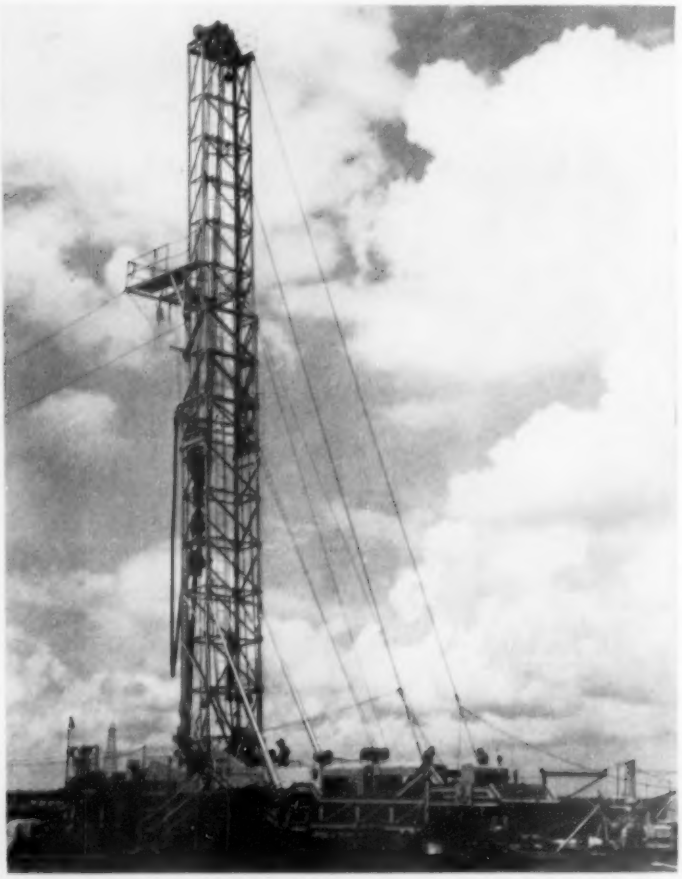
3. The greatest promise for slim hole lies, as we see it, in harder formations and especially in deepening existing cased wells.

THE AUTHOR

F. M. J. Valint, drilling engineer, Mobil Oil of Canada, Ltd., received his technical training in Hungary, after which he went to Venezuela where he worked on the gold fields and later in the oil fields. From Venezuela he went to Trinidad, where he was employed with Trinidad Leaseholds, Ltd., until 1938. In 1939 he joined Drilling & Petroleum Engineering, Ltd., a contracting firm. In 1941, Valint joined the U. S. Army Engineers, in charge of power-plant construction, maintenance, and operations in the Caribbean area. In 1948 he began work for Trinidad Petroleum Development Co. as drilling and equipment engineer, until 1953, when he came to Canada and joined Socony-Vacuum Oil Co. of Canada, Ltd., in the capacity of drilling engineer.



THE AUTHOR COMPARES slim-hole costs to those on a conventional 9-in. hole drilled with this type rig.



SAVINGS MADE POSSIBLE by slim-hole drilling are not necessarily obvious. On a 6¾-in. hole, the cost on tubular goods is reduced at least 22 per cent.

Slim Holes Are O.K.—In the Right Spots

Both operators and contractors are looking to slim-hole drilling as a means of combating increasing costs. What is needed is a favorable "climate" in thinking

by Philip L. McLaughlin
Cardwell Manufacturing Co.

NO drilling contractor needs to be told that drilling costs have soared spectacularly over prewar levels.

Labor costs are up. Taxes and insurance have increased. Equipment costs far more than it did before the war. Furthermore, drilling contractors are asked to drill harder formations and deeper holes than were considered economical even 5 years ago.

They are asked to do this on footage contract rates that years ago would have looked cheap. The result has been that, in many cases, profits have been squeezed to the vanishing point and many contractors are feeling undue economic pressure.

But contractors do not have the corner on trouble. Producers are finding that it costs more to discover and produce a barrel of oil.

In spite of better geophysical and geological techniques, it is harder now to make a really important discovery. With the average well depth gradually increasing and harder formations being penetrated, it is more difficult than ever to keep total cost of discovery and exploitation of reserves under control.

A bulk of the increased costs chargeable to both discovery and exploitation is the result of higher drilling costs. One of the most promising ways to decrease production costs is to reduce the cost of exploration and development drilling. Of all the ways known today to reduce drilling and completion costs, **slim-hole techniques are the most promising and least understood.** This does not mean that drilling contractors do not know what slim-hole drilling is. Nearly every drilling contractor has a healthy interest in the subject, but a survey recently conducted revealed

MOVING COSTS and rigging-up time are cut appreciably when using slim-hole rigs. This becomes an important factor in areas like the Denver-Julesburg basin.

IN ULTRA SLIM-HOLE work, every variable favors diamond drilling where hard or medium-hard formations are expected.

widespread misunderstanding of just how slim-hole drilling could reduce costs.

A similar survey among producers indicated a lack of knowledge about how slim-hole completions could be used in field development programs.

Conventional and slim-hole rigs . . . The savings made possible by slim-hole drilling are not necessarily obvious. This article will attempt to present the economic considerations of slim-hole drilling in true perspective.

In order to do this, the author selected four different rigs suitable for drilling four sizes of holes to a depth of about 6,000 ft. Two of these hole sizes are considered slim and one is considered ultraslim. A 9-in. hole was used as a standard. The rigs selected are composite rigs that have been chosen to illustrate how slim-hole drilling cuts cost.

All major factors affecting over-all drilling costs have been tabulated in Tables 1 through 6.

From line A, Table 2, the reduced horsepower requirements of slim-hole drilling are illustrated. On line B, the weight of the complete rig is given. Since first cost is related to total weight, the cost figures reported on line C are not entirely unexpected. It should be noted, however, that since slim-hole rigs are frequently wheel-mounted, a somewhat higher cost per pound of weight is expected. This extra cost is often a good investment because it reduces moving costs as shown in Chart 1, and rig-up time as shown in Chart 2. One of the greatest single advantages of the slim-hole rig is the reduction of rig-up time because the lighter rig can be moved in fewer packages.

The lighter weight of rigs, lower initial costs, and the smaller personnel requirements of slim-hole rigs are reflected in the daily rig costs as shown in Chart 3 and Table 3.

It is most important that these daily rig costs be kept in mind because they compensate for shortcomings in bit performance.

After moving costs and daily rig costs, savings in tubular goods are most spectacular. Lines F, G, H, and I of Table 4 give cost figures to show just how important the savings in tubular goods can be in slim-hole completions. Chart 4 shows the relative savings that might be expected by using different completion programs.

Roller-Bit Cost Considerations

When considering the relative cost of slim-hole roller bits, the only constant the observer can be certain of is the lease price. The design (and performance) of slim-hole bits currently is in a state of flux. Field results are inadequate, and even if they were adequate they would probably be obsolete before they were published.

Recent slim-hole bit designs appear to be great improvements over earlier versions. In fact, some contractors are actually claiming faster penetration rates with slim-hole bits than are being obtained with big bits in the same area.

These experiences are the exception rather than the rule. Most contractors and bit manufacturers concede that "big" bits give somewhat better performance but there is no agreement as to how much better.

In the absence of reliable performance averages and in the absence of the rock bit designers' notes, it seems expedient to use accepted basic principles in anticipating relative performance per bit.

TABLE 1—DRILLING AND COMPLETION PROGRAMS

	Conventional holes	Slim holes		Ultra slim hole
Hole size, in.	9	6¾	5⅞	3¾
Drill pipe, in.	4½	†3½	†2⅞	...
Casing (oil string), in.	7	5½	*4	*2⅜
Tubing, in.	2⅞	2⅜	1½	None

*Tubing set as casing. †Drill tubing.

Advantages and disadvantages of slim-hole drilling are clearly shown by these graphs that compare the various factors affecting conventional and slim-hole costs. Probably the largest savings are in moving, daily rig costs, and the cost of tubular goods. Notice that the bit performance in slim holes is reduced, but the over-all bit cost per foot for slim holes compares favorably with the conventional hole.

Bit design . . . It is essential that the reader keep in mind that for maximum life, slim-hole rock bits are not scaled down from "big" bits proportionally. As a matter of fact, bit designers often select desirable tooth heights, hard facing, and bearing areas, and try to fit these into a given bit design. The performance of any individual bit size

TABLE 2—RIG SPECIFICATIONS AND ESTIMATED COSTS

Item—	Conventional rig 9-in. hole	Slim hole rigs 6¾-in. hole	Slim hole rigs 5⅞-in. hole	Ultra slim hole rig 3¾-in. hole
A. Rig horsepower	600	320	150	80
B. Weight of complete rig, lb.	750,000	350,000	200,000	100,000
C. Cost, including drill string	$300,000	$220,000	$125,000	$60,000

TABLE 3—DRILLING COSTS

Item—	Conventional rig 9-in. hole	Slim hole rigs 6¾-in. hole	Slim hole rigs 5⅞-in. hole	Ultra slim hole rig 3¾-in. hole
D. Cost, 100-mile move	$3,000	$1,500	$800	$440
Daily rig cost	$800	$625	$525	$325
E. Rigup time, days	3	1½	1	Less than 1 day

TABLE 4—COMPLETION COSTS PER FOOT

Item—	Conventional 9-in. hole	Slim holes 6¾-in. hole	Slim holes 5⅞-in. hole	Ultra slim hole 3¾-in. hole
F. Casing cost per foot, N-80 (oil string)	7-in. $2.60	5½-in. $2.05	*4-in. $1.15	*2⅜-in. $0.60
G. Casing cost factor	1.0	0.79	0.44	0.23
H. Tubing cost per foot	2¾-in. $0.87	2⅜-in. $0.64	1½-in. $0.50	
I. Casing-tubing cost factor	1.0	0.78	0.48	0.17

*Tubing.

TABLE 5—ROLLER BIT COSTS AND FACTORS

Item—	Conventional 9-in. bit	Slim holes 6¾-in. bit	Slim holes 5⅞-in. bit	Ultra slim hole 3¾-in. bit
J. Bit cost (3 cone jet, per bit)	$197.50	$156.50	$137.00	
K. Bit price factor	1.0	0.79	0.7	
L. Drilling factor weight d_1/d_2	1.0	0.75	0.625	
M. Bearing area factor d_1^2/d_2^2	1.0	0.56	0.40	
N. Bearing life factor M/L	1.0	0.75	0.625	
O. Cutting volume factor d_1^2/d_2^2	1.0	0.55	0.40	
P. Tooth volume factor d_1^2/d_2^2	1.0	0.42	0.25	
Q. Tooth life factor P/O	1.0	0.75	0.625	
R. Bit cost per ft. factor K/(N or Q)	1.0	1.05	1.12	

TABLE 6—DIAMOND BIT DATA AND COSTS

Item—	Conventional 9-in. bit	Slim holes 6¾-in. bit	Slim holes 5⅞-in. bit	Ultra slim hole 3¾-in. bit
S. Cost per bit	$5,280.00	$3,360.00	$2,540.00	$1,310.00
T. Bit cost factor	1.0	0.64	0.48	0.25
U. Weight on bit factor D_1^2/D_2^2	1.0	0.56	0.40	0.17
V. Footage per bit factor	1.0	1.0	1.0	1.0+
W. Costs-per-foot factor	1.0	0.64	0.48	0.25

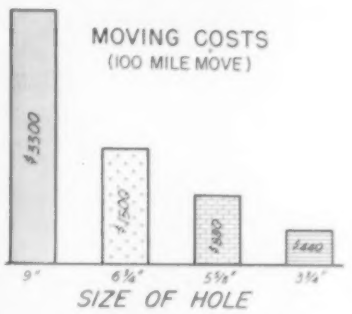


Fig. 1—Slim-hole rigs can be moved at a considerable savings.

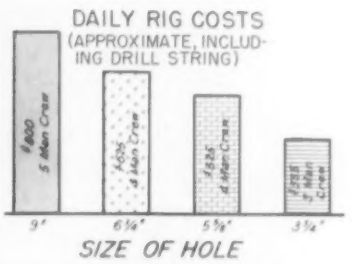


Fig. 2—The lower daily rig costs on slim-hole rigs must always be borne in mind.

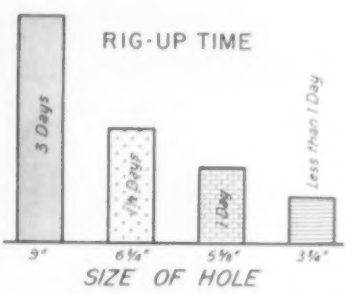


Fig. 3—The slim-hole rig can offer a decided advantage in rigging up.

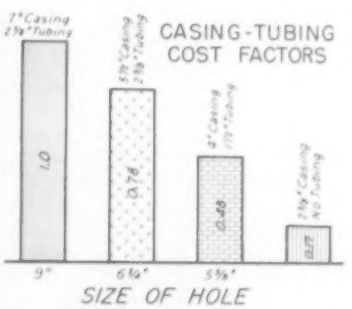


Fig. 4—Slim-hole completions can save the oil company over 50 per cent on casing and tubing costs.

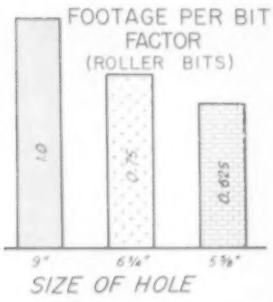


Fig. 5—Drilling with small-size bits reduces the footage per bit, compared to a conventional 9-in. bit.

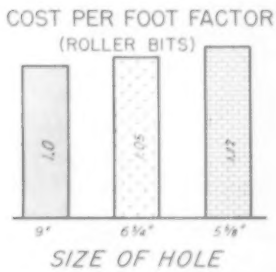


Fig. 6—Although slim-hole-bit performance is 37.5 per cent lower than the conventional 9-in. bit, the bit cost per foot is only 10 per cent greater.

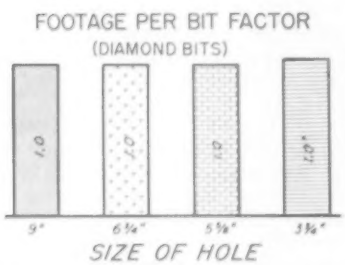


Fig. 7—The diamond-bit performance in slim holes is on a par with that of conventional diamond bits.

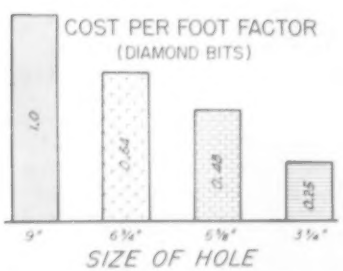


Fig. 8—In diamond drilling, the slim hole has a decided advantage as far as diamond bit cost per foot is concerned.

What Are the Right Spots for Slim Holes?

A DRILLING contractor or producer is likely to ask himself, "What effect will all the variables in Tables 1-6 have on my drilling and completion costs?" This question can be answered by following the principles of the calculations outlined but substituting actual rigs and local well depths and drilling conditions. In this way a contractor or producer could estimate ahead of time how much a slim-hole program might save. From repeated calculations like this, certain generalizations appear.

Hard-formation areas . . . The prospects for important savings are comparatively poor at the present time. In these hard-formation areas, moving time and moving costs are a small percentage of the total well costs. Drilling time is a high percentage of the total time on location. Relative penetration rates and footages per bit have a greater effect on total well costs than in the case of soft-rock areas

The comparatively severe crooked-hole situation also retards the acceptance of slim holes in hard-formation areas.

Soft-formation areas . . . Slim-hole techniques promise important savings in areas like the Gulf Coast and the Denver-Julesburg basin. Due to fast penetration rates, few round trips are required. Actual drilling time is a relatively small percentage of total time on location. Moving costs and rig-up time are comparatively more important because of the short drilling time. Actual drilling time may be less than 50 per cent of the total time on location, which in itself may be less than 15 days in many areas.

and type may deviate considerably from what would be expected if small bits were simply scaled down versions of big bits. Many recent bit records indicate that slim-hole bits are performing far better than the following analysis would indicate.

It is safe to conclude that the bit performance expectation for slim-hole bits presented in Chart 5 would be the worst that could be expected. In all probability actual experience will give a far better comparative performance.

The prices shown on line J, Table 5, were obtained from a bit manufacturers' catalog. Prices and performance data on 3¾-in. roller bits are not given in this table because roller bits in this size range are not currently considered suitable for economical drilling. When these prices were translated into ratios, the "roller bit price factor" of line K, Table 5, was obtained. A substantial reduction is evidenced in the price of slim-hole bits as compared to 9-in. bits. Many people feel that the 8¾-9-in. bit is the industry performance standard, so this size was selected for comparison purposes.

Bit prices are meaningless unless bit performance is also considered. In order to get further information about the relative merit of various bit sizes, it is necessary to consider weight on bit, bearing area, and the tooth volume-formation volume ratio.

Bit performance . . . Since roller bits approximate "line contact" with the formation, leading bit manufacturers recommend that for constant penetration rates the weight on the bit should be **directly** proportional to bit diameter. Transformed into ratios, the "drilling weight factor" of line L is obtained.

A study of the design of three-cone rock bits will show that the bearing area will tend to be proportional to the square of the bit diameter. This is expressed as a "bearing area factor" on line M of Table 5.

When one compares line M with line L, it is immediately apparent that available bearing area is decreasing faster

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than the required drilling weight, as bit sizes are reduced.

As a result, bearing loadings are increasing and the "bearing life factor" as shown on line N indicates that (where bearing life is the limiting factor) smaller bits can be expected to give less footage.

In some formations, however, tooth life is the limiting factor in rock-bit life. In order to estimate tooth life it is necessary to consider the volume of cuttings to be removed as shown on line O, and the tooth volume available to remove these cuttings as shown on line P.

Since formation volume per foot of hole varies as the square of hole diameter and the tooth volume available to remove these cuttings varies generally as the cube of the diameter it is expected that tooth life would decrease with bit size as shown on line Q.

Whether bearing wear or tooth wear limits roller-bit life, the theoretical results are similar (see Chart 5). This chart gives a pessimistic estimate of the relative footage per bit.

What effect will this have on bit costs? A reference to line K of Table 5 will show that bit prices are going down almost as fast as theoretical bit performance. So the net result is an insignificant theoretical increase in bit costs as shown in Chart 6.

Many contractors are reporting excellent comparative results in slim-hole sizes, with the effect that slim-hole bit costs are actually reduced rather than increased. In view of these experiences and the theoretical results of Chart 6, the writer does not feel justified in predicting any change in bit cost with decreasing size.

Diamond-Bit Cost Considerations

With diamond bits an entirely different cost picture exists because of two facts:

1. Since a diamond bit has no bearings, its lift is relatively unaffected by size.

2. Since the diamonds used tend to be proportional to the square of the bit diameter, and since stone costs are the major part of diamond-bit costs, the prices of diamond bits drop rapidly with a reduction in bit size as shown on line T, Table 6.

The price of diamond bits are listed on line S is alarmingly high, but the contractor should bear in mind that these bits generally have a very high salvage value—frequently exceeding 70 per cent.

With diamond bits, the footage per bit as shown on Chart 7 is relatively unaffected by hole diameter. Some people believe that the performance of diamond bits in the smaller sizes is actually superior to that obtained with larger bits.

When a contractor considers Chart 7 and the "bit cost factor" of line T, Table 6, it is immediately apparent that diamond-bit costs per foot drop very rapidly with a decrease in hole size, as shown in Chart 8.

It is extremely important that a slim-hole drilling contractor give careful consideration to the economic advantages of diamond bits where hard or medium hard formations are encountered.

Every variable swings in favor of diamond bits as hole sizes become smaller.

Crooked-hole problems tend to make diamond bits comparatively attractive. It is well known that crooked-hole problems are aggravated by heavy drilling weights. With roller bits, those problems may become quite severe in the smaller hole sizes if satisfactory penetration rates are maintained. With diamond bits, on the other hand, required drilling weights tend to vary as the square of the bit diameter. Satisfactory penetration rates may be maintained with relatively light weights in the similar hole sizes.

Summary . . . Slim-hole drilling in hard-formation areas, like the Permian basin, does not seem to offer important savings at the present time. In the event that 2-in. or 2½-in. tubing can be used as casing, very spectacular savings might result through the use of extremely light rigs and small diamond bits as suggested in Column 4 of Table 1.

Constant improvements are being made in the penetration rates of diamond bits. Some operators report that these rates are already comparable to roller bits in harder formations. Diamond bits may drill for 1 week or more. With long bit life, round-trip speed becomes relatively unimportant and short, low cost masts may be considered.

Much experimenting needs to be done in applying diamond bits to slim-hole-drilling problems, but this is a most promising avenue of investigation in hard-formation areas.

Even if slim-hole roller bits give 30 per cent lower footage per bit, the added drilling time is insignificant when compared to the savings that can be made through lower moving costs, shorter rig-up time, and lower daily rig costs.

It is important to consider the lower daily rig costs when estimating the savings that may be realized from slim-hole drilling.

Slim-hole problems . . . There is evidence now that the reduction in daily rig charges is being carried to an unhealthy and unrealistic extreme, in some cases.

Since drilling contractors were generally unwilling to take the risks associated with slim-hole-drilling experiments, leading operators contracted for small rigs on a day-rate basis.

All too frequently, the contractor who supplied these rigs was also dependent upon the same operator for a high percentage of his "big-hole" work. In a situation like this, a contractor would be understandably reluctant to argue about the day rate charged for his "little rig."

Slim-hole outlook . . . It is important that the industry develop an educational program and a contract "climate" that will accelerate the widespread adoption of slim-hole techniques.

Perhaps the most important single step that needs to be taken is to educate independent producers (and some majors) on the practicability of slim-hole completions for field development wells in all areas. This would apply in all fields except those where extremely large volume of gas or fluid are produced, or where severe corrosion problems exist. The lack of acceptance of slim-hole-completion techniques is perhaps the most important single factor holding slim-hole drilling back.

When this educational program has created a big demand for slim-hole drilling, the next most important problem to be faced is the development of a contract "climate" that makes slim-hole drilling economically attractive to contractors. In this regard, one severe problem that needs to be faced is the fact that a high percentage of the rigs now in use are not paid for. The contractor cannot afford to get rid of his present rig; he cannot afford to use it for slim-hole drilling because daily costs are too high; and he cannot afford to buy a new rig for slim-hole drilling until his present rig is paid out.

This financial impasse is expected to retard the adoption of slim-hole drilling, but if slim-hole completions are accepted and a favorable slim-hole contract climate is established, the industry can look forward to an early and important reduction in drilling cost averages.

Acknowledgment . . . Much credit is due James T. Morris, Morris & Co., for his assistance in the preparation of this paper.

What Do Gulf Coast Operators Think of Slim-Hole Drilling?

Despite the fact that there are many factors in favor of this type of operation, not many producers or contractors have evinced much enthusiasm for it

by Ed McGhee
District Editor

AS far as can be determined, only two major producers on the Gulf Coast are drilling slim holes on a regular basis. Of these two, one has only recently begun slim-hole work. Neither company gives out cost figures, but the fact that they continue to use the technique indicates that it is saving money. Mostly, these two operators are using the small-diameter holes to develop shallow fields where they have a large number of wells to be drilled.

A lot of slim holes have been drilled by independent operators on a one-time basis. Most of these have been wildcat wells.

The small-diameter holes have been drilled to a variety of depths and under a variety of conditions. As a result, on the Gulf Coast, the question is not whether a slim hole can be drilled, completed, and produced, but under what conditions it can be done economically.

What is a slim hole? . . . Gulf Coast operators are defining a slim hole as one drilled with a 6⅛-in. to 6¾-in. bit size. Usual practice on these holes is to set 7-in. or 7⅝-in. surface pipe and 4½-in. oil string. This oil string may be line pipe or oil-well casing as depth of the well dictates.

Several slim holes have been drilled from under surface pipe to as deep as 10,000 ft. One company drilled a 6⅛-in. hole to 16,000 ft. with 3½-in. drill pipe. Mud weight was 17 lb. per gal., and pump pressure was about 2,900 psi. on the last section of hole.

Several times, slim holes have been directionally drilled, although this practice is generally considered poor. Other slim holes have penetrated deep, high-pressure zones, but there is too little experience in this type operation to draw any conclusions. The tendency seems to be for the pipe to knock down the wall cake during trips. Then when circulation is started again, the high-circulating pressure forces some of the heavy mud into weak formations until the mud cake builds up again.

In slim hole's favor . . . There are several factors that make the Gulf Coast suited to slim holes. First, except at extreme depths, the formations drill fast regardless of hole size. The slim hole may use more bits, but the small bits are usually cheap enough to keep total bit cost in line.

Second, other than immediately around the salt domes, Gulf Coast wells have no crooked-hole problems. Crooked-hole tendency in other areas slows the slim hole and makes it expensive.

Gulf Coast wells probably have the highest mud bills of any area. Slim holes require less mud volume; and since mud volume directly fixes total mud cost, a slim hole's mud program will ordinarily cost less than for a conventional hole.

Bad well locations common to this area also favor the slim-hole rig. These light rigs can move cheaper, and moreover, less money need be spent on preparing locations.

For the deep, hard formations, diamond bits are stepping up drilling rates and bit runs. The small-diameter bits are even giving better results than the conventional-size diamond bits in many cases. It may be that the diamond bit will turn out to be the answer to objections to slim hole in some hard-rock areas.

Not geared for slim holes . . . Many Gulf Coast operators would like to try slim-hole drilling—at least, experimentally. But they find that the contractors generally are not geared to drill a small-diameter hole economically. The operators need the incentive of a cheaper footage bid to drill a slim hole, but most contractors are in no position to bid cheaper on it. If a contractor has to use the same rig as on a regular-size hole, his costs on a slim hole would be as much or more than an a conventional hole.

Some operators have taken the ball by using the contractor's equipment on a day-work basis to drill slim holes. Most of the savings on a slim hole—like cheaper pipe, less mud, and less cement—are in the operator's favor, not the contractor's, so the day-work arrangement has paid off for both parties in some cases. Not enough slim holes are being drilled to make it profitable for the average contractor to tie his money up in a slim-hole rig that might be idle much of the time.

Making the hole . . . Contractors who have drilled slim holes on the Gulf Coast report no particular trouble in drilling nor completing the wells. Drilling rate may be slightly slower and bit life shorter, otherwise operation is just like on conventional-size wells. Most of the rigs doing slim-hole work are trailer-mounted but some are shallow standard rigs.

For drilling string, most contractors are using 2⅞-in. drill tubing, 3½-in. drill tubing, or 3½-in. drill pipe. Generally, the string carries enough 4¾-in. drill collars to keep the pipe in tension. However, some contractors run only one or two collars, put drill pipe above, and complete the string with drill tubing. Then, the drill pipe is used like drill collars and is run in compression.

Weight on the 6⅛-in. bit runs from 4,000 to 15,000 lb., depending on well conditions. Mostly the bits are jet.

Some objections . . . Still the most frequent objections to the slim hole are the matters of setting an intermediate casing and working the well over after completion. Many producers feel that they drill too few wildcats—most of which are to great depths—to take even the remotest chance of casing themselves out of the hole. Once they have a well on production, they do not care to have the oil string too small to washover the production tubing.

DRILLING WAS UNEVENTFUL on the first hole drilled with Slim Hole Drilling Co.'s new rig. The draw works, derrick structure, and rotary are all mounted on one skid. Fig. 1.

Skid-Mounted Packages Improve Portability

Latest addition to the equipment doing slim-hole work on the Texas Gulf Coast is a skid-mounted rig of Slim Hole Drilling Co., of Houston. The compactness and convenience of this rig's arrangement make it quick to move and simple to rig up for drilling.

by Ed McGhee
District Editor

BY using skid-mounted packages, Slim Hole Drilling Co. has given its new rig excellent portability. As the accompanying cuts show, the draw works, derrick substructure, and rotary are all mounted on one skid. On a second skid are mounted the engines, compound, and main mud pump.

In order to tie together the two skid packages for drilling on a new location, it is necessary only to make pin connections on the skids, fasten one chain, and couple several fluid hoses. As a result, the rig can ordinarily be expected to be ready for drilling within 8 hours of arriving on location.

Moving the rig . . . Altogether, the entire rig can be moved in 9 or 10 loads, including drill tubing. Each of the two big skid packages is a separate load, and the mast is two loads. Actually, the mast can be considered one and one-half loads since other materials can be hauled with its two sections.

The draw-works package and the engines-pump package are of the same over-all size. Each is 10½ ft. wide and 30 ft. long. The draw-works skid weighs 52,000 lb. while the engines-pump skid weighs 58,000 lb. Both weight and width of these packages exceed the limit for highway travel without a permit. Probably it would have been possible to make them within highway width limits, but weight could not have been reduced to the nonpermit maximum. Since it's not much more trouble to get both width and weight permits than to get a weight permit alone, this contractor chose to make the skids wider and gain the extra work room.

Also giving extra working room are the 4-ft. extensions that run the full length of both sides of the two skid packages. These fold back onto the skids for moving. Moreover, the engine shed moves with its skid unit. It is collapsible, and doesn't have to be dismantled to move.

All lines—mud, water, fuel, and air—are built into the skids of the two packages. When the two units are joined together on a new location, the lines are connected together with speedy hose connections. This arrangement of the lines saves rig-up and rig-down time as well as assuring the contractor that the lines will not be misplaced or damaged in moving. Fig. 2 shows some of the lines entering the rear of the pump skid.

The equipment . . . Hoisting capacity of the new rig is ordinarily considered to be 7,500 ft. of 4½-in. drill pipe. However, current plans calls for using 3½-in. N-80 tubing with 2⅞-in. tool joints. In this case, the depth limit for hoisting is extended beyond 10,000 ft.

The draw works is a Portable Rig CT-5, and the mast is a 96-ft. Lee C. Moore with 290,000-lb. capacity. Drilling engines are two Model 671 twin GM diesels which give a total of 520 continuous horsepower. A Model 671 single diesel powers the standby pump.

The main mud pump has a 350 input-horsepower, and with 4½-in. liners it will deliver 200 g.p.m. at a maximum pressure of 2,000 psi. The standby pump is used to mix mud, gun pits, and to drill to its 1,200-psi. capacity with 4-in. liners. The main pump carries a surge damper.

With the 3½-in. tubing as drill stem, the pump capacity of the rig will permit jet-bit drilling to about 10,000 ft. At this depth, the pump will give a nozzle velocity through ⅜-in. jets of about 278 ft. per second. With the 2⅞-in. tool joints, this drill string will require lift plugs for making round trips, but the added hydraulic efficiency should more than make up for the loss in trip time.

On three levels . . . Equipment on the two main skid packages is arranged on three different levels. On the draw-works skid, the derrick floor is some 3 ft. higher than the draw works itself. However, the driller has a good view of the floor and all the activity on it. Moreover, the mud-pressure gage, weight indicator, and blowout-preventer controls are mounted directly in front of the driller within his reach.

The third level of equipment is on

the engine-pump skid. Between each of the three levels, there are steel stairways on either side of the skids.

The derrick substructure is 6 ft., 6 in. high. Presently, the rig carries a Shaffer double-gate blowout preventer using a spool with 2-in. outlets. However, there is room enough by mounting the skids on 12 by 12 timbers, the contractor says, to add a Hydril preventer as well as the usual fill-up line and choke manifold.

Slim Hole Drilling's rig has all electric auxiliaries. There are two diesel-driven generators that develop 24 kw. each. This power drives one air compressor and one centrifugal pump. In addition, one air compressor and one centrifugal pump are driven from the draw-works compound.

Power transfer . . . Power for drilling is transmitted from the engine compound to the draw works by means of a chain. Of course, when the rig is moved, this chain must be broken. This is only a matter of minutes and removing one pin. In rigging up, the skids of the two packages are fastened rigidly together in as little as 30 minutes by means of steel pins and plates. Then, the chain can be replaced very quickly. The chain guard itself is telescoping and is, therefore, easy to take off or replace.

When the mast is raised during rigging up, the weight of it has a tendency to make the skid packages bow up in the middle. Since this changes the distances between the chain sprockets, a special device was installed to give the chain slack while the mast is raised.

The first hole . . . The first well drilled by Slim Hole Drilling's new rig was the 1 Klein for Oil Properties, Inc., of Dallas. Located in the Tomball district of Harris County, Texas, this wildcat was drilled to a total depth of 5,700 ft. Since some of the rig's time on location was consumed in completing rig-up and in ironing out any equipment defects that showed up, no real comparison of drilling time is possible. The contractor does estimate, however, that the hole drilled at an average of about 50 to 60 ft. per hour for the time the bit was on bottom.

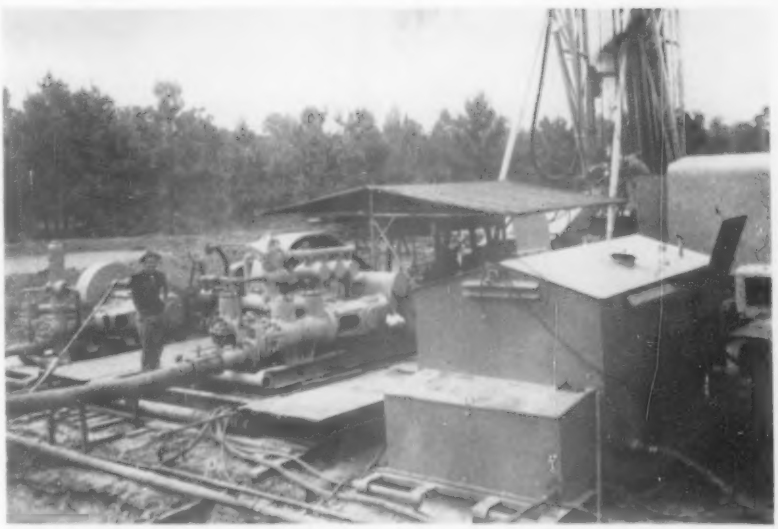
Surface hole on the 1 Klein was 9⅞-in. and drilled to 300 ft. with one bit. Then, 7-in. surface pipe was set. A 6⅛-in. hole was drilled from this point to total depth at 5,700 ft., using five jet bits. The drilling string was made up of ten 4¼-in. drill collars and 3½-in. flush-joint drill pipe. Weight on bit was 15,000 lb., and there was no crooked-hole trouble.

The hole was drilled with water to 4,000 ft. There, it was mudded up, with a gel-phosphate mud. Viscosity was 35 seconds and weight 9.8 lb. per gallon.

Drilling was uneventful. No hole trouble developed, nor was there any coring or drill-stem testing. Electric logging and wire-line coring was carried on without running casing. However, had there been production, a 4½-in. casing string would have been set.

Swing in mud suction . . . One new device used by Slim Hole Drilling is a swing in the main mud pump's suction. This swing makes it possible for the suction point to be placed at any depth from top to bottom of the mud pit. On the 1 Klein there were no settling pit nor shale pit—the active pit received the return mud from the flow line. Ordinarily in this area sand is a big problem, eating away pump liners and pistons. However, by keeping the pump suction right at the top of the pit by means of the swing, Slim Hole Drilling managed to keep the sand out of the pump suction. At the completion of the well, the liners and pistons showed no wear whatsoever. In fact, the mud technician on the job said that the mud being pumped showed the lowest sand content of any well of his experience in the area.

New contractor . . . Slim Hole Drilling Co. is a recently formed corporation with Tom J. Beaty as president, Robert H. Martin as vice president, and William T. Jones as secretary-treasurer. The Houston firm's Rig 1 is on its second well at the time of this writing.

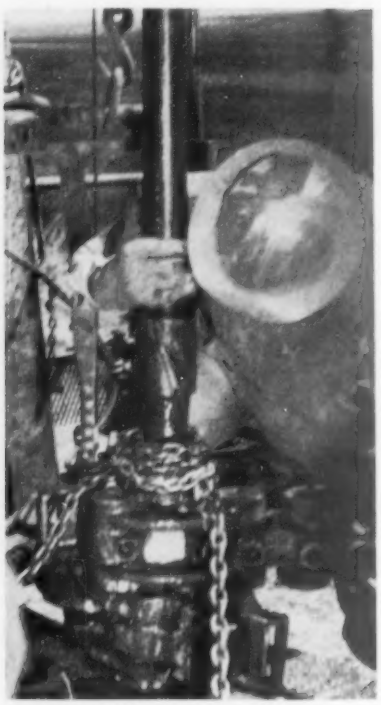


THE ENTIRE RIG can be moved in 9-10 loads, including drill tubing. Notice the 4-ft. extensions on each side of the skid, giving extra working room. Fig. 2.

CHANGING LINERS on the main pump. The pump is a 7½ (maximum) by 14 and puts out 1,550 psi. using 4½-in. liners for drilling with a 6⅛-in. bit with three 3/32-in. jets. Fig. 3.

TUBING STRING in the mousehole; tubing tool joint installed as connection, on Zephyr Drilling Co. rig.

BREAKING OUT a connecting sub from the tubing in use as drill pipe.



TUBING IN USE as part of lightweight drilling string, with tubing tool joints on all tubing.

Tubing Tool Joints—

"The best friend your drill tubing has ever had."

Many slim-hole drilling strings are now being made up of tubing with tubing tool joints. Here is a quick summary of how to put tubing tool joints to work for you in this and other drilling and production operations.

by Frank C. Gignoux

TUBING tool joints are, of course, designed for attachment to tubing, but generally this attachment is not a permanent one. The joints are attached to tubing when the string is in use involving frequent round trips. Before the production tubing is finally set, the joints may be removed and the string run in, connected in the conventional way with tubing couplers. The same joints can thus be used over and over again on numerous strings of tubing.

It is obvious that this procedure will save much wear on tubing threads and, by reason of the fast makeup and breakout of the joint, make a definite saving in time.

Light drilling strings of tubing made up with tubing tool joints are being used. Such savings render a saving over the use of conventional drill pipe in slim-hole drilling, cleanouts, workovers, fishing, cement squeezing, liner setting, formation and production testing, acidizing, etc. Many operators have such strings made up and available for these and other uses where round trips with tubing are necessary. By doing this, the production tubing as finally set should be subjected to a minimum of thread damage.

Author is with Reed Roller Bit Co., Houston.

In slim-hole drilling . . . Zephyr Drilling Co., of Tulsa, finds use for tool-joint-equipped tubing in slim-hole drilling operations. Zephyr has a string of 2⅞-in. o.d. Range 2 N-80 E.U.E. tubing box-and-pin tool joints attached. This contractor has had good success drilling with 30 joints of 3½-in. i.f. 13.3-lb. drill pipe above twelve 4½-in. drill collars and about 16,000 lb. on a 6⅛-in. jet-type rock bit. The string is used from a drilling mast on a single trailer and has been used to drill below 6,000 ft.

Zephyr considers that the use of the tubing string above the drill pipe and collars reduces pulling weights on the drilling mast and, thereby, increases the depths the rig will reach.

Handling . . . To facilitate careful handling of the joints, some users have specially designed trays or containers for the storage and protection of their joints when not in use. Some, for further convenience, mount these containers on small trailers so that the entire set may be transported to the location where the joints are to be used. Then, after the job is completed, the joints are removed from the tubing, cleaned, repacked in the container, and returned as a unit to a tool storage, in readiness for the next job.

Often-pulled wells . . . On wells re-

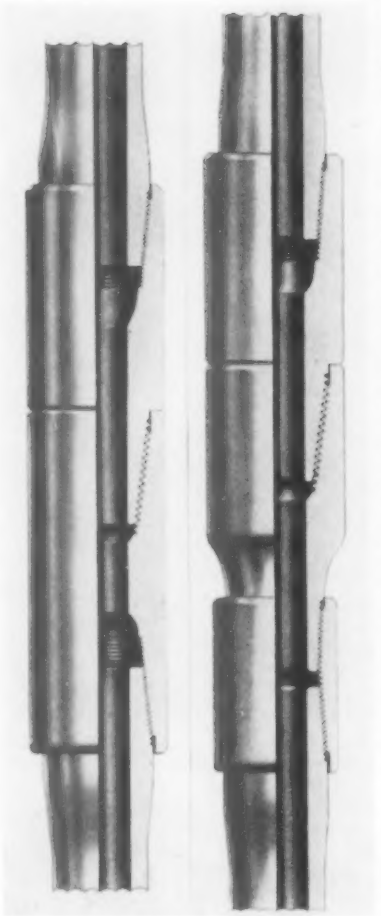


Fig. 1 (left) and Fig. 2 (right). Fig. 2 is the coupling type and is used for attaching to tubing as received, with couplings attached.

quiring frequent pulling of the tubing, some operators will have tubing tool joints permanently attached to doubles, trebles, or fourbles in the production string. This gains advantage in trip time and save tubing thread damage.

In workover . . . One large Gulf Coast independent always uses tubing tool joints or small drill pipe whenever the company has a workover, squeeze, or completion that requires three or more trips. This firm owns a string of connector-type (screws into collar of tubing) tubing tool joints; and due to the heavy, coarse tool-joint threads, more than 30 per cent can be saved in the time of making trips. Moreover, the superintendent of this company feels that he makes great savings in tubing-thread wear. He says that when the tubing is used for several trips without using tool joints, the connections almost always leak under pressure.

Three types . . . Tubing tool joints are normally made for 2⅜, 2⅞, and 3½-in. tubing. Outside diameter of the joints is the same as or only slightly greater than the diameters of the corresponding size couplings. Figs. 1 and 2 show the most common designs. The type in Fig. 2, whose convenience is obvious, is the coupling type and is used for attaching to tubing as received, with couplings attached. This type is not intended for permanent attachment, nor is it recommended where torque beyond the strength of the coupling may be imposed.

A third type is available for flash-welding to plain-end external-upset tubing. Some operators prefer this integral

PORTABLE RACK of welded pipe construction for transportation and storage of tool-joint equipped tubing.

connection on permanent, general-purpose strings. All types are made internal flush and are bored to the same internal diameter as that of the corresponding size tubing.

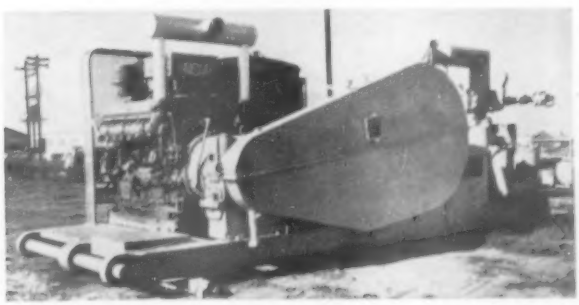
The same exacting standards used in the manufacture of conventional tool joints are invariably used in the manufacture of tubing tool joints. The design, however, renders them comparatively short and light in weight. They are, therefore, proportionally less expensive than conventional tool joints.

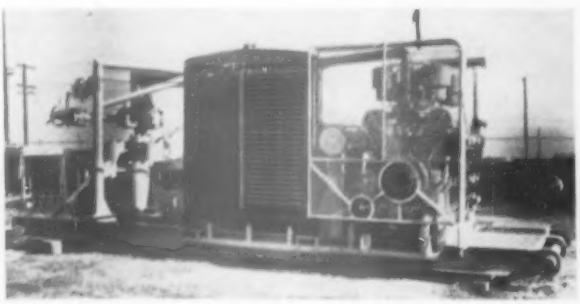
While it is difficult to evaluate accurately the economy in using tubing tool joints, it is not hard to show a time saving in round trip time of as much as 40 per cent over using tubing couplings. This time saving alone will make the payout relatively rapid.

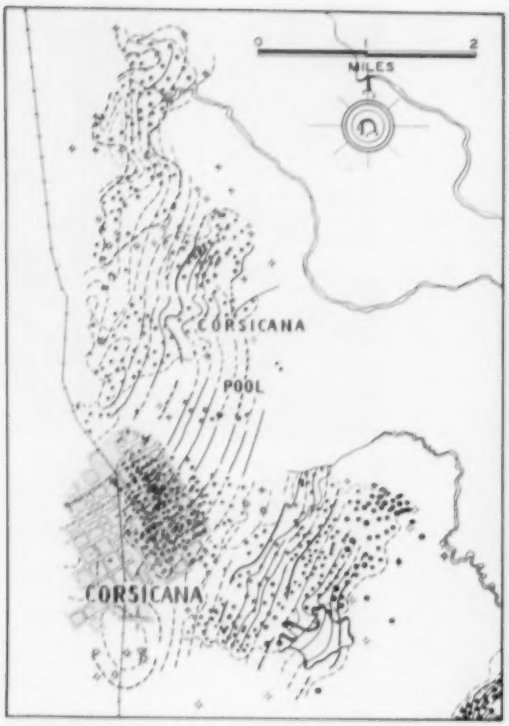
Offset Radiator Makes Highway-Width Package

Shown here is the pump package fabricated by M. Bink Manning, drilling contractor of Houston. By offsetting the radiator on the engine, Manning has made the skid package only 8 ft., 4 in. wide—within the maximum that may be transported on the highways without a special permit. Weight of the entire unit is only 32,800 lb.

The engine is a Hall-Scott model 2269 which is rated at 350 continuous horsepower. It drives the pump, a D-300 Emsco, through a built-on torque converter. Manning uses this package on his Rig 7 which has drilled slim holes for various operators on the Texas Gulf Coast. He reports excellent service and increased rig portability.







ROUGHLY 50 HOLES A MONTH are being slim-holed to the 1,100-ft. Wolfe City sand in the approximate 1,000-acre town-lot area of Corsicana Shallow field.

FIRST JOINT of 2⅜-in. drill pipe disappears as new Corsicana backyard project spuds in. Rig is small Failing unit owned and operated by Ross & Boldin, Corsicana contractor.

They're Really Slim at Corsicana

Backyard wells punched down in total elapsed time of a day and a half

by Robert J. Enright
District Editor

SLIM-HOLE drilling has just about reached the ultimate in the current spectacular Corsicana town-lot drilling play in Corsicana Shallow field of Navarro County, Texas.

At mid-August more than 370 holes had been punched down to the 1,100-ft. Wolfe City sand in 8 months.

The shallow wells are drilled in as little as 12 hours actual drilling time by small rotaries — almost entirely Mayhew and Failing units rated at from 1,500 to 2,000 ft.

It takes the little fellows only about a day and a half to complete a well—from the time the rig is moved in until it moves off with the hole ready for fracture treatment. In 1½ hours, one of the small rigs can move and be drilling on a new hole. In most cases, they are completely mobile with mud pumps set on the bed of a truck, the drill pipe on a truck or trailer. Footage rates average about $1.00 a foot. There is no day work or waiting on casing.

Before a rig moves onto location, the only visible evidence that a well is going to be drilled is a small mud pit. The contractor moves in, sets up, digs a shallow trench to the mud pit which contains a few barrels of fresh water, and starts drilling. Rig fuel is butane.

Drilling . . . Surface pipe is seldom used, the only pipe employed being the oil string. The oil string generally used is 2½-in. regular or upset tubing, although 4-in. line pipe is run in some cases.

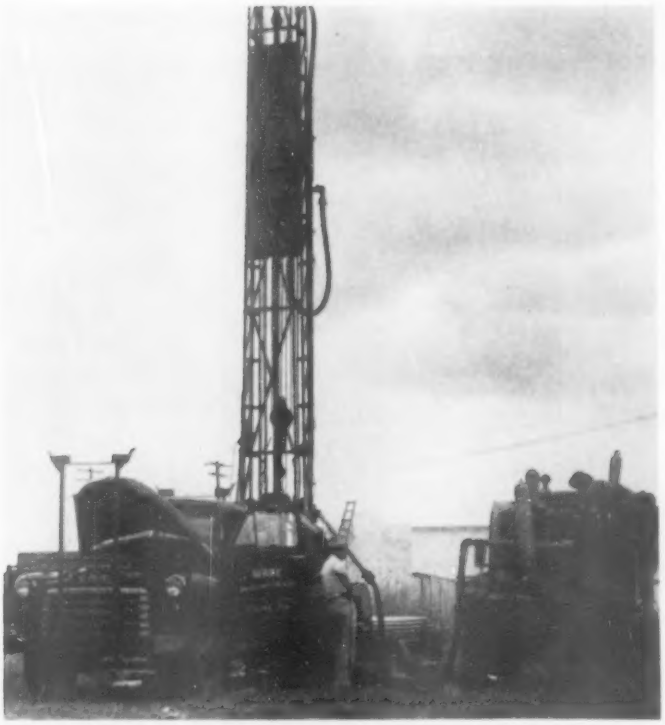
Contractors use 2⅜-in. drill pipe and 5½-in. or 6¾-in. drag bits, bit size depending on size of the oil string. The smaller bit is used with the 2½-in. oil string, the 6¾-in. with the 4-in.

The 2⅜-in. drill pipe is run in singles off the bed of the truck or trailer and laid down on the truck coming out of the hole.

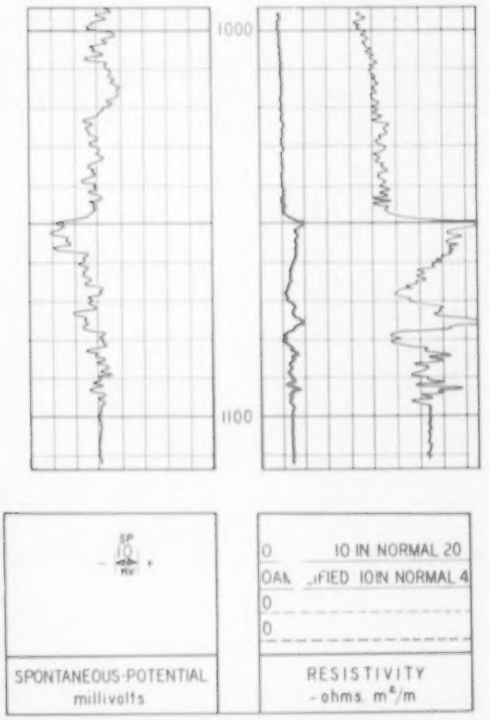
Drilling fluid to begin with is fresh water hauled in by tank truck and dumped into the mud pit. Water circulates down the drill string, back to the surface, and flows down the shallow trench back to the mud pit. The water becomes a native drilling mud after the first few hundred feet of hole is cut. No additives are used.

Contractors can get by without surface pipe due to the absence of shallow water sands of any consequence in the area.

An interesting outgrowth of this sort of drilling in the Corsicana town lots



MOBILITY of the small rotaries is obvious in this shot of Failing 1000 operated by Ware Drilling Co., Ltd. Mud pump is mounted on G. I. truck. Drill pipe is run off and laid down on a flat-bed, rubber-tired trailer which is hooked on behind one of the trucks when moving to new location.



TYPICAL CORRELATION LOG of shallow Wolfe City sand producer on Corsicana town lot. Pay zone occurs at 1,050 ft. and is a tight shaly sand that responds to fracturing.

has been establishment of a mud-disposal service. A tank truck equipped with vacuum pump visits each well about twice on the average, sucks up exxcess drilling mud, and hauls it away to disposal areas.

Completions . . . The contractor drills straight through from the surface to the ultimate total depth ranging from 10 to 30 ft. into the Wolfe City with the 5½ or 6¾-in. bit. Drilling is fairly fast, although the shaly formations cause some sticking. Drag-bit consumption is about one per well.

The 2½-in. oil string is run, usually with a seating nipple, and landed on a hard sandstone cap rock about 2 or 3 ft. thick and directly overlying the Wolfe City. General practice is to run centralizers and stabilizers made in local machine shops to center the oil string in the hole.

The pipe then is cemented all the way to the surface, leaving about 20 to 30 ft. of plug. On the tail end of the cement run, roughly five sacks of Cal-Seal are added alternately with the last five sacks of cement for a quick set.

Although practices vary, most contractors figure displacement rather than run a plug on top of the cement. Little if any cement fouls the hole below the casing, the cement choosing the path of least resistance and channeling up hole behind the oil string.

The cement sets hard in about an hour, and the contractor drills it out using a shop-made 2¼-in. blade bit. The tiny bit is made from 1-in. line pipe. Three slots are cut lengthwise into the business end at 120° angles and triangular pieces of ⅜-in. steel plate inserted in the slots and welded. The cutting edges of the bit are coated with a hardening agent.

A 2½-in. reamer, manufactured in the same manner, is made up in the 1-in. drill string a certain distance above the bit. The 2½-in. bit will go through the seating nipple on the bottom of the 2½-in. oil string, but the 2½-in. reamer will not. When the reamer bumps the seating nipple, the drilling-in job is finished.

Drilling-in fluid during this operation is hot salt water. The brine is hauled in by tank truck. It comes from the deeper Woodbine formation in the area. The brine is hot when it leaves Woodbine wells but may be heated further to the point where, as one contractor put it, "you can't hold your hand in it."

The hot brine serves as an effective washing agent, knocking off and disintegrating the mud cake on the pay sand. The brine is circulated until it reaches the top of the hole clean.

The brine then is replaced with oil and the hole is ready to fracture. The rig is moved off location.

Fracturing . . . The usual fracture job consists of 15,000 lb. of sand, and 10,000 gal. of fluid and is carried out in three 5,000-lb. stages. Some jobs have taken as much as 30,000 lb. of sand and 15,000 gal. of fluid.

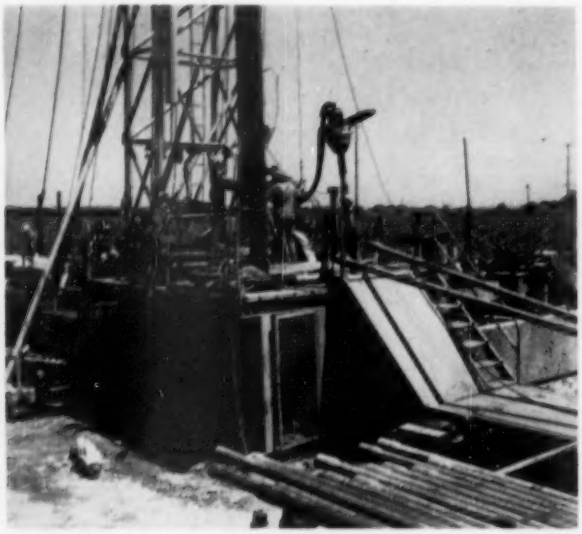
Most jobs at first used low-gravity crude from nearby Nacatoch sand wells in Burke and other small pools east of Corsicana as the carrier fluid. The crude ranged from 21° to 23° gravity and made an ideal carrier.

More recently, demand for fracturing fluid became too great for the supply of Nacatoch crude, and producers now are using local crude treated with Petrofrac.

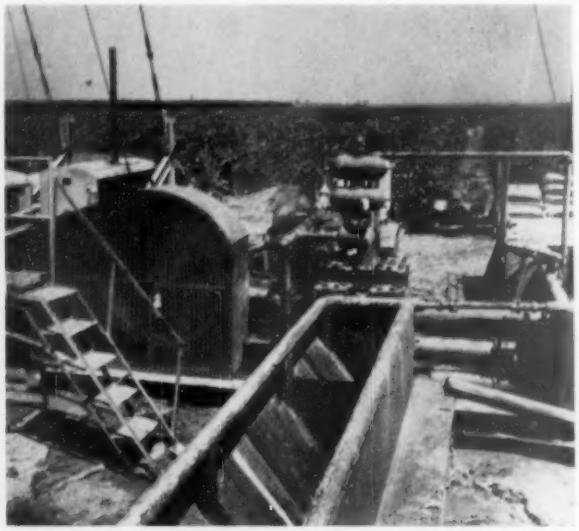
Wells which would produce 2 or 3 bbl. natural, come in producing about 25 to 30 bbl. daily on the average. The best natural wells in the town lots pumped 10 bbl. an hour on 24-hour production test.

Where the 2½-in. oil string is used, the 1-in. line pipe used to drill out cement becomes both tubing and rods.

The 1-in. is connected to the pumping unit at the surface with a flexible hose. A variety of down-hole pumps are used, including: metal-to-metal, three-tube metal-to-metal, and cup-type insert pumps.

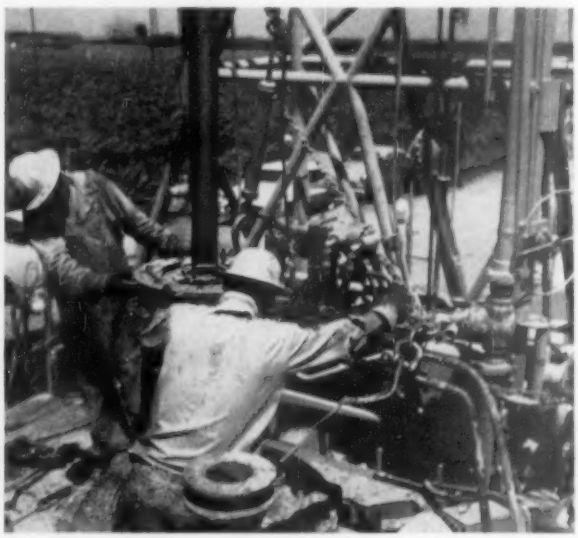


THIS HIGHLY UNITIZED Drill-Pro rig moves complete in eight loads; on short moves drilling can be started after four loads are moved.



COMBINATION MUD-DITCH and sand trap requires only four connections. Pipe at top of ditch serves as a mud-mixing line and gives ditch added stability.

TRAILER MOUNTED auxiliary mud pump is another feature on the rig that insures fast moves.



HYDRAULIC TUBING TONGS being used to tighten a new joint of 4½-in. drill tubing to the drill string.

Complete move in eight loads . . .

Built-In Portability Achieved Through Clever Unitization

by D. H. Stormont
West Coast District Editor

THE new trailer-mounted rig being used by Drilling & Production Co. for contract drilling in San Joaquin Valley is designed for easy rig-up and tear-out, rapid moving, and reduced labor costs.

Its exceptional portability was achieved through several novel unitization ideas. By integrating several units usually moved as separate packages, the complete rig and 5,000 ft. of 4½-in. drill pipe are moved in eight loads.

For short moves off state highways, the rig and enough pipe to drill the

surface hole are hauled in four loads. The remainder of the rig—drill pipe and extra pipe racks—is then moved in the contractor's trucks while drilling of the new hole is in progress.

Efforts to reduce labor costs have not been wholly successful. Through use of air slips and hydraulic tubing tongs, initial operation was with a three-man crew instead of the usual four. The first three wells, involving a total of about 10,000 ft. of hole, were drilled with the small crew. On the fourth hole, a 5,800-ft. well in Mountain View field, the labor-saving devices were dropped in favor of a four-man crew. The contractor, however, intended to further try the three-man operation.

The rig is a Cardwell Trailerig with modifications to meet Drill-Pro's needs for a rig which could be used for slim-hole work as well as for routine development drilling. Two diesel engines driving through hydraulic couplings provide 420 hp. at the hoist. Or, driving through a power takeoff, they can provide 380 hp. to the 14 by 7¼ by 14-in. main mud pump.

The rig is rated for 5,000 ft. with 4½-in. drill pipe and 8,000 ft. with 4-in. drill tubing. A 180-hp. diesel-driven pump mounted on a tandem four-wheel trailer is used for mud mixing and as an emergency pump.

The rig is packaged so that on long moves it breaks down into the following eight loads:

1, 2. Drill trailer and 104-ft. telescopic mast.

3. Main power pump skid and mud-storage rack.

4. Unitized subbase and mud-storage tank.

5, 6. Unitized sectional pipe walkway and pipe basket, with 1,000 ft. of drill pipe and 200 ft. of drill collars. Additional drill pipe is hauled in contractor's trucks as required.

7. All-purpose trailer.

8. Mud ditch and miscellaneous equipment.

Mud system . . . Particular attention was paid to unitizing the mud system. The 200-bbl. mud-storage tank was combined with the base of the 7½-ft. subbase. The shale shaker then was mounted on top of the tank on the sump side.

The 20-ft. mud ditch which connects the tank to the pump suction pit serves the dual purpose of a sand trap. Baffles placed at intervals in the ditch knock out the sand, which is then removed through dump gates in the base of the ditch. How effectively it removes sand is shown by the fact that on the Mountain View location as much as 20 bbl. of sand was dumped from the system when it was cleaned out during round trips. Used 4-in. pipe welded to the upper rim of the ditch gives it added stability, as well as serving as mud-mixing lines.

Flow lines into and out of the ditch fit into sleeves welded to the mud tank and suction pit. The latter and the "pill" pit are unitized onto the main power-pump skid. Instead of usual flange or quick makeup couplings, air-tube unions provide the seal on the two mud line connections. More flexibility thus is permitted in positioning the mud ditch with respect to the mud tank and suction pit.

Another feature of the mud system is the flexibility provided. A 10-in. bypass between the suction pit and mud-storage tank permits mud to be withdrawn from storage if fluid is being lost to the formation. Likewise, if the mud volume tends to increase, the extra mud can be bypassed to storage. If there is insufficient fluid to maintain full circulation, such as is the case after the sand trap is dumped during a round trip, the pumps can be supplied directly from storage instead of waiting for the ditch to fill.

Little time is required in making and breaking connections during rigging up and dismantling. After the three mud-system components are properly spotted, inflation of the two air-tube unions and tightening of two hammer unions on both the bypass line and mud mixing line complete the installation.

. . . The all-purpose trailer houses auxiliary equipment which on many rigs makes up two or more truck loads. Permanently mounted in this 35 by 8 by 13¼-ft. high unit are: a 150-bbl. water tank, 2,500-gal. diesel-fuel tank, 300-gal. lube-oil storage, 25-kw. generator, an 18-ft. dog house, and tool room. To provide stability while the trailer is on location the wheels are dug in so that the base rests on the ground.

Slim-Hole Air Drilling Solves Tough Problem

REED DRILLING CO., of Tulsa, solved a difficult drilling problem recently with air drilling in a slim hole at a geological wildcat in Rogers County, Oklahoma.

The well was drilled for Transcontinental Oil Corp. to obtain stratigraphic information. The operators had originally drilled to 2,602 ft. and had set 5½-in. casing; they wanted to drill another 100-150 ft. They moved a cable-tool rig on the hole, but the rig only made about 3-4 ft. in a week.

Reed moved its Rig 1 and was able to make as much as 6 ft. of hole per hour using air as the circulating medium and tungsten-carbide button bits. Since 5½-in. casing had been set, the contractor used a 4¾-slim-hole version of the larger and familiar "chert" bit (see photo).

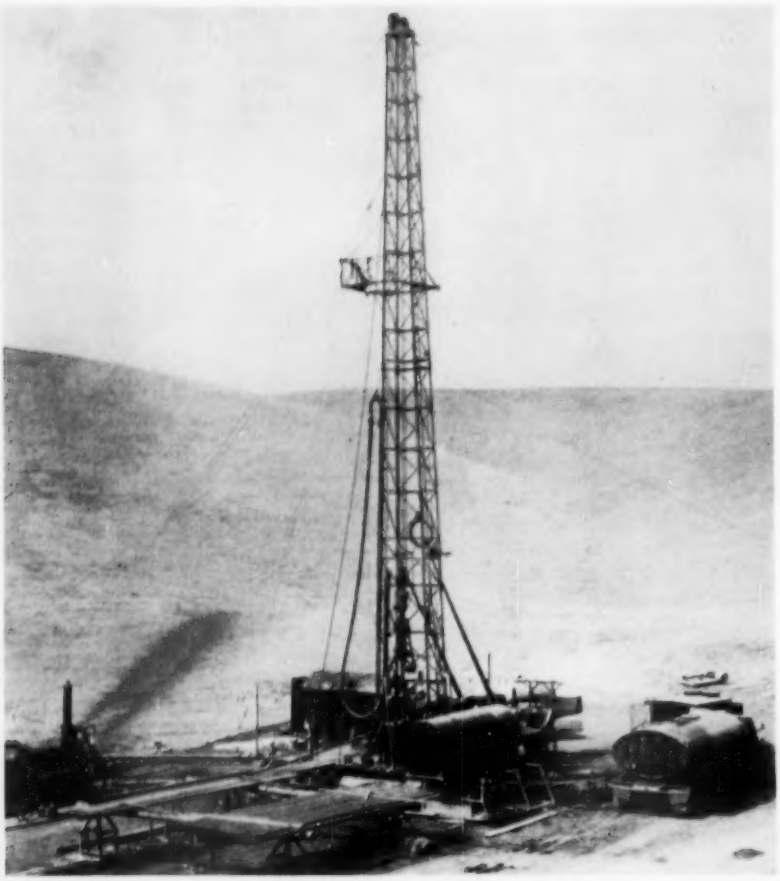
On the well, Reed used a trailer-mounted rig with 2⅞-in. drill pipe. During the early stages of the deepening job, the contractor had one compressor. Unexpected water, however, forced the use of two compressors, each capable of delivering 600 cu. ft. of air per minute at 200 psi. The additional compressor was able to handle the 800 ft. of water in the hole.

While drilling, the contractor used ten 3⅜-in. drill collars. Reed carried 10,000 lb. on the bit with the rotary table turning at 80 r.p.m.

Total rotating time on bottom was 42 hours making 121 ft. of hole. Best drilling time recorded was 10 minutes per foot and the slowest was 28 minutes.

The success in deepening this well indicates that slim-hole air drilling should have a bright field in deepening old wells even where hard abrasive formations such as chert or quartzitic formations are expected.

Size comparison between the 4¾-in. tungsten-carbide slim-hole bit and a conventional 7⅞-in. bit.



More than a half million feet of hole punched. Here's a

Rig With a Record

THE rig used by Continental Oil Co. in its recent stratigraphic drilling program in western Washington has compiled an outstanding footage record during its 13 years of service.

As of last June 1 the rig had drilled 156 exploratory holes. Total footage at that time was approximately 525,000 ft. Since then it has drilled two additional strat tests in California for the regional exploration department and in late August was nearing completion of another hole near San Juan Capistrano.

The rig is a Failing 66, rated at 4,000-ft. capacity with 3½-in. drill pipe. Originally truck-mounted, the old chassis has been converted into a trailer on which is mounted a hydraulic-lift mast.

Drilling power is supplied by a 145-hp. diesel engine. The 7½ by 12-in. power pump and 180-hp. diesel used for mud circulation are likewise trailer-mounted. The entire rig, which employs four-man crews, is hauled in eight loads.

Prior to 1950 the rig was used to drill 102 tests, totaling 337,057 ft., in Kansas, Oklahoma, and in West and Southwest Texas. During the next 1½ years it continued to work in Oklahoma and Kansas. Since then it was used largely in the Rocky Mountain area until it was moved to Washington in the spring of 1954. There during 1954 and the first few months of this year it drilled 10 test holes in Grays Harbor and Pacific counties.

Washington activity . . . The stratigraphic tests drilled in western Washington mostly were in the 3,000 to 3,900-ft. range. The program followed was to set 8⅝-in. surface casing in 12½-in. hole and then to drill a 7⅞-hole to total depth. As in other earlier tests drilled in this area, minor gas shows were encountered but only in one well were these sufficiently encouraging to justify extensive testing.

Cost of carrying on exploratory operations in areas remote from oil supply centers is reflected in the accompanying table. During 1950, 1951, and 1953, when the rig was largely used in Oklahoma, Kansas, and Montana, over-all costs ranged from about $5.50 to $7.40 per foot. In 1952 while working in mountainous areas of Utah and Wyoming, costs were double. Muddy roads plus the long distances from supply centers increased costs of the Washington work to over $10 per foot.

Drilling muds were a particular problem in the Washington drilling. Shales were encountered which would hydrate and rapidly disintegrate in the presence of conventional mud. The fact that makeup water had to be trucked in, plus the chemicals and weight materials required in treating, resulted in mud costs becoming a costly item.

To solve the problem a unique modified, inhibited mud was used. Chemicals added in pounds per barrel of mud, were: 0.2 caustic soda, 4 to 5 Lignox, 0.5 to 0.7 Driscose, 5 to 6 lime, and 5 per cent by volume diesel oil.

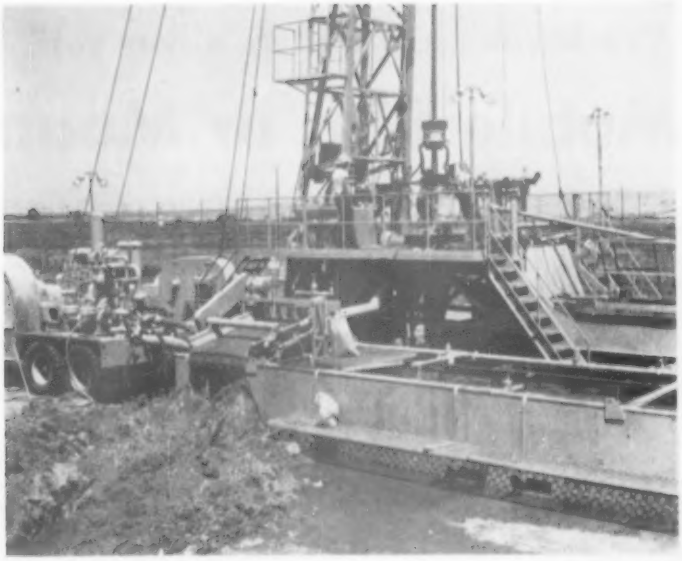
Purpose of the relatively large amounts of lime and Lignox was to saturate the mud with calcium ions, and thereby inhibit the hydration and swelling of formation clays. The Driscose and oil were for filtrate control and for their protective colloid action.

SUMMARY OF THE STRAT RIG'S DRILLING OPERATIONS

Year—	No. holes completed	Total footage drilled	Over-all cost per foot	Actual drilling cost per foot*
1942 to 1949	102	337,057		
1950	10	36,546	$5.47	$3.90
1951	10	33,492	7.37	5.19
1952	7	25,834	12.87	8.23
1953	14	47,967	6.47	4.07
1954	8	30,687	10.82	6.28
Total	151	511,583	$5.25	

*The actual drilling-cost feature excludes expenditures for: surface casing, cement, drill-stem tests, dipmeter surveys, diamond coring, other outside services, electric logging, depreciation, permit fees and damages, day work, digging and filling pits, road and location work, surveying and plugging costs.

THIS HIGHLY PORTABLE RIG of Gene Reid Drilling, Inc., makes use of a self-propelled hoist.



THE POWER PUMP and its twin-diesel are trailer mounted along with a light plant and 250-gal. diesel fuel tank.

Slim-Hole Rig Moves in Three Loads

by D. H. Stormont
West Coast District Editor

A NEW rig of Gene Reid Drilling, Inc., Bakersfield, is one of the few in California particularly designed for slim-hole drilling.

Principal drilling equipment is highly mobile. A self-propelled hoisting unit uses the same diesel engine to drive the draw works. The rotary table, drive, cathead shaft, and sand reel are mounted on a 40-ft. offset bed semitrailer. A second semitrailer holds the power pump and its diesel, a generator plant, and a 250-gal. diesel-fuel tank. All are free to travel over California highways without special permit.

Aside from drill pipe, only three loads are moved by truck. These consist of the doghouse, pipe basket and rack, shale shaker, and the mud tanks and ditches.

Since being placed in operation last spring, the rig has drilled nine wells. None were slim holes. Rated to drill these holes to 7,500 ft., using 2⅞-in. drill tubing, the rig is capable of completing conventional holes to about 5,500 ft. One of the wells it has completed involved deepening of an old producer from 4,200 ft. to 5,600 ft.

An idea of the rig's portability and hole-making ability can be gained from its performance on two wells. In one case the rig started moving at 6 a.m., traveled 340 miles, and by midnight the crew had it ready to spud. At another well, hole was spudded one morning and then abandoned 30 hours later at 1,000 ft. This included time for running two electric logs.

...The hoisting unit is a Hopper "Hoistmobile." Power for propelling the vehicle over the road, as well as for driving the draw works, is supplied by a rear-mounted diesel engine. The 12-wheel vehicle is driven onto the well site, rather than backed in as is the case with trailer-mounted rigs, so that a minimum of time is required for getting into drilling position.

Power from the 300-hp. prime mover is changed from the road-drive transmission to the hoist by switching a master control. Hoisting operations are facilitated by torque-converter drive, a hydraulically actuated transmission, and air clutches. The 93-ft. telescoping mast is elevated from the traveling position by means of a hydraulic lift.

The mast is equipped with double in-line crown blocks so that two sets of traveling blocks are used. One line strung to the double-drum draw works handles the drill tubing, a second handles the kelly and swivel. There is no need for a rathole. A pneumatic block retractor holds the kelly blocks out of the way when the drill lines are being operated.

...The offset bed trailer backs up against the hoisting unit. Lowering of hinged sections provides the drilling platform, 7½ ft. aboveground.

The independent rotary drive and cathead shaft assembly are powered by a 185-hp. diesel engine, driving through a torque converter and transmission. The engine, and sand reel, are mounted under the flat-bed portion of the trailer. Chain drives and controls for the cathead shaft assembly need not be disconnected when folded into traveling position. Over-all width of the trailer when on the road is 8 ft.

Controls for the engine, rotary, and cathead shaft are mounted at the right rear of the trailer. Thus they are opposite those for operating the hoist when in a working position. Removal of a section of the pipe walkway (the flat-bed portion of the trailer) provides access to controls for the sand reel.

...The mud-pump trailer contains a 200-hp. twin diesel which, through a torque converter, drives a 7¼ by 12-in. power pump. Also mounted are a 25-kw. diesel-driven power plant and a 250-gal. fuel tank. This unit is positioned alongside the hoist when in operation.

"We haven't lost a truck driver yet"

Mobile Rigs in Mountain Country

by R. E. Jackson

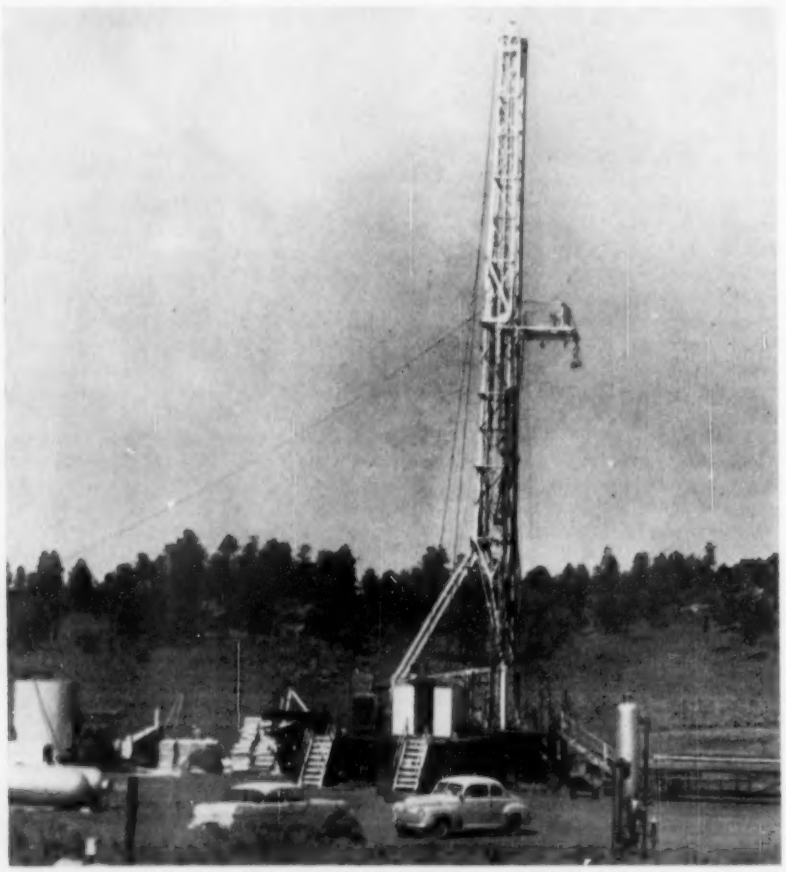
MOBILE drilling equipment has a definite advantage in the light-rig category even in mountainous country. These same advantages should be more apparent and result in greater savings in flat-land operations. It is doubtful that the advantages of this equipment as used on shallow work could be used to the same advantage in larger rigs.

During the summer of 1953 our company decided to purchase a trailer-mounted rig capable of drilling 4,000-4,500-ft. depths at altitudes of 6,000 to 8,000 ft. and also portable enough to be able to drill 2,000-3,000-ft. depths and compete with smaller rigs. In other words, a rig designed for the San Juan basin.

The author is president of Empire States Drilling Corp., Albuquerque, N. M.

The basin is roughly 8 million acres, located in the four corners area of New Mexico, Colorado, Utah, and Arizona, and is a challenge to contractors and operating companies alike in that the depth to almost every producing formation ranges from zero to 9,000 ft.

It was our intention to have a rig for the Pictured Cliffs formation, or roughly 2,000 to 4,500 ft. A trailer-mounted Unit 34 draw works with hydromatic brake; Twin Disc torque converter; powered by WAK Waukesha with high compression heads; 94-ft. Lee C. Moore telescoping derrick with 5-ft. substructure and extension to raise to 8 ft.; a D-175 6¾ by 12-in. Emsco pump, powered by NKU Waukesha; 4½-in. drill pipe, and 6¼-in drill collars made up our purchase. Since that time we have had occasion to obtain cost averages of mobile rig operation against smaller conventional skid-mounted rigs.



SAVINGS ON MOVES have amounted to $200 to $400 per well. This insures a reasonable payout on the added cost for the mobile rig.

Two major savings . . . First, moving costs over a period of 2 years have averaged 12 per cent of our income dollar, which makes it one of the major expense items. With two smaller conventional rigs of our own with which to compare costs, our best estimate is that savings on the trailer-mounted rig averages between $200 and $400 per move. At this rate, we believe that the slightly larger investment in such a rig will give us a reasonable payout. Second, we have found that semipermanent installation of our valves, connections, pipe, etc., has eliminated loss of several thousands of dollars in each year's operation.

Some of the economy that can be had from the faster rig-up of this type equipment is lost to us because of the distance factors involved in our area. Actual on-the-road time comprises a much greater portion of our moving costs than most other areas. A recent example that we had was a move to a direct offset location on a 160-acre spacing pattern where the actual road mileage by the shortest route was 31 miles. On such a move, the few hours saved in rigging up are often lost in a cost analysis due to that being a relatively smaller amount of the total moving and rigging-up costs. It is my opinion that this economy, while present in our operation, would be far more noticeable in operations in flat-land country and proved fields with shorter moving distances involved.

Special moving problems . . . We face other problems in the San Juan basin area besides the distance involved in moves; these are principally the poor quality of roads and the mud and snow hazard. Much of the country is sandy, which makes moving and rig-up as difficult as in mud. One of our most difficult and unpredictable problems comes

from washouts and flash floods, and the washouts require major road work before a rig move can continue.

These uncontrollable factors make it difficult properly to analyze the effective savings found in mobile equipment. Three cars were lost in August due to flash floods.

One particularly limiting feature to trailer-mounted equipment in this country is the problem of overhang. Most of our moves at some point in the route pass through one or more arroyos. These are anywhere from 2 to 20 ft. deep and are usually one-car road width. For road-building economy a bulldozer simply hogs out on either side and fills in the bottom, providing a sharp dip in the road. To facilitate moving our own trailer-mounted mast, which has a horizontal length on the road of 56 ft., Empire States Drilling Corp. acquired an Army 6 by 6 truck tractor, without a cab roof. This gives us a little more mobility, as the crown block overhangs the cab. By taking the dips slowly we haven't lost any truck drivers yet, but did manage to collapse a cab roof or two when we first started.

Equipment of much larger size, requiring greater weights and greater lengths than that of the type rig discussed here, would not be practical in our country in my opinion and would be confined principally to flat-land or field operation. Last year, however, a 127-ft. telescoping trailer-mounted mast was designed and built for operation in this country, employing the principle of a hook-and-ladder-type trailer, complete with a steerable rear trailer driver. At last reports, the mobility of this equipment was good in that it had considerable flexibility to negotiate turns and dips; but it had not been used enough to give good cost data on rig-up time required.

Another deterring factor to larger type equipment is the tremendous torsion twists and strains placed on the equipment during movement over rough, irregular roads. Where the trailer unit itself comprises all or part of the substructure for the drilling rig, it must be built strong enough to withstand these strains or the stability of the drilling platform and ultimate life of the rig is greatly shortened. Several years ago we purchased a light trailer-mounted rig that had been working very well in West Texas on 3,000-ft. work. After about 12 moves in the mountain country, the trailer bed developed some serious weaknesses and we were forced to remount the rig on a conventional substructure and skids.

Highway restrictions . . . Weight limits present a problem in all parts of the country and while a good portion of our moves involve an off-highway operation, we still must be prepared to move on state highways. By nature, trailer-mounted or mobile equipment is an attempt to put a major portion of a drilling rig on wheels. It almost always involves a highway overload requiring a special permit to move. And no permit loads can move on New Mexico highways over Saturday or Sunday.

There has been some feeling in our State Highway Department that no permit loads should be allowed if the rig can be disassembled into parts and carried to the destination without exceeding load limits. If this line of reasoning were pursued, it of course could destroy all the economies inherent in mobile equipment. Some engineering studies have been made which indicate that weight alone is not the chief cause of deterioration to our highways but politically the cry of "overloaded trucks are destroying our highways" has great popular appeal.

While our principal discussion has been aimed at the trailer mounting of a draw works and telescoping mast, other portions of the rig can also be adapted to mobile operation. On this same rig we have built a pipe rack and walkway trailer which backs up to the rig floor when set up for drilling. In moving, the kelly, drill collar, and the pipe racks are rolled onto this trailer and it is ready to move in a minimum of time. The pipe racks fold out from this trailer.

Our future plans call for trailer mount of our Emsco D-175-6¾ by 12-in. mud pump and Waukesha NKU motor on a lowboy trailer. By sinking the wheels in trenches at the location we feel the pump unit can be placed low enough to provide normal suction lift. This is about as large a pump unit as can be carried on New Mexico highways as a package unit. Other advantages would be permanent housing, which is a major factor in subzero temperatures.

When fully completed, this will give us about as mobile a piece of equipment as can be had today. Only the drill pipe, dog houses, and miscellaneous drilling equipment wold be moved on regular trucks. The mast, draw works, walkway with pipe racks, and mud pump would all move on their own wheels. Such a rig provides an additional economy in being semirigged up when moved on location with a minimum of planning required to set the rig in operation.

On one recent highway move of 210 miles in this area, under perfect conditions, we started at 5:30 a.m. and raised the derrick at 4:30 p.m. All eight loads of the rig were set in on location. Our savings on this one move were considerable.

Cat Line Used to Tong Up Tubing

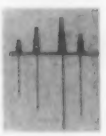
ACE WELL SERVICE, of Fort Morgan, Colo., saves the use of a tong line by simply putting a loop in the spinning rope around a hook in the end of the tong handle. When the tubing is being pulled, the rope is looped around the pipe while it is being pulled in the usual manner. As soon as the slips are set and the tongs applied, the cat line is looped around the end of the tongs; the tongs are worked until the pipe is loose and then the rope is already tight on the spinning line. When going back into the hole, the spinning line is used in the usual manner until the pipe is tight. The loop is then hooked around the end of the tongs and tonged up tight.

Drilling Contractors Are Becoming Oil Producers To Keep Rigs Busy

1,162 Contractors in U. S.
107 Contractors in Canada

3,745 Rigs Owned in U. S.
323 Rigs Owned in Canada

2,923 Rigs Operating in U. S.
286 Rigs Operating in Canada



36,730 Wells Drilled 1954 in U. S.
1,700 Drilled 1954 in Canada

Today contract drilling is big business. With 3,207 rigs operating, the oil industry is spending over 3 million dollars a day on drilling operations. But in contract drilling there is room for both the big and little fellow for only 50 contractors have 10 or more rigs and 1,112 contractors have fewer than 10 rigs. And interestingly enough, 940 out of the 1,162 United States contractors, or 81 per cent of the total, each own four rigs or fewer.

Although several of the larger oil companies have their own rigs, contractors drill about 80 per cent of all wells drilled in the United States. Contractors are also oil operators and producers, for 80.5 per cent of those in the United States have production. Most of the 227 contractors who have not found oil are trying to establish production. Today contractors have little choice but to enter the oil business in order to keep their rigs busy. In order to get the contract, it is often necessary to submit a bid based on a working interest in the well. Or the more aggressive contractor will take on a drilling obligation and sell it to some small oil company. The contractor retains a share in the deal for a "turnkey job."

Ownership of Rotary Rigs For 1,162 Contractors

No. of contractors owning	No. of rigs each owns	Cumulative total contractors	Cumulative total rigs owned	Per cent of rigs owned	Per cent of contractors
1	76	1	76	2.03	
1	47	2	123	3.28	
1	43	3	166	4.43	
1	32	4	198	5.29	
2	30	6	258	6.89	
1	27	7	285	7.61	.60
2	24	9	333	8.89	.77
1	22	10	355	9.48	.86
1	19	11	374	9.99	.95
3	18	14	428	11.43	1.20
3	17	17	479	12.80	1.46
3	15	20	524	14.00	1.72
3	14	23	566	15.11	1.98
2	13	25	592	15.81	2.15
6	12	31	664	17.73	2.67
4	11	35	708	18.91	3.01
15	10	50	858	22.91	4.30
9	9	59	939	25.07	5.08
21	8	80	1,107	29.56	6.89
25	7	105	1,282	34.23	9.04
48	6	153	1,570	41.92	13.17
69	5	222	1,915	51.13	19.10
93	4	315	2,287	61.07	27.11
158	3	473	2,761	73.72	40.71
295	2	768	3,351	89.48	66.09
394	1	1,162	3,745	100.00	100.00

. . . and in Canada

98 contractors in Alberta own	298 rigs
6 contractors in Saskatchewan own	22 rigs
3 contractors in other provinces own	3 rigs
61 contractors in Calgary own	216 rigs
32 contractors in Edmonton own	73 rigs

The drilling industry employs 62,069 employes, and the vast majority of these, of course, are in the driller or roughneck class. Although the census does not show it, employment in the drilling industry is becoming more stable and working conditions are constantly improving. Contractors are carrying out safety programs that have resulted in substantial savings to the contractors and bonuses for the safety-minded crews.

62,069 Employes of Drilling Companies

2,430 Executives

(Who have part in buying pattern)

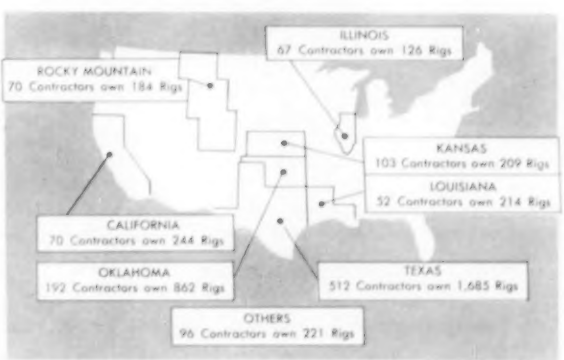
(Includes those who also push their own tools)

2,980 Superintendents . . . Tool Pushers

51,045 Drillers . . . Helpers 5,614 Others

The drilling industry is concentrated in the principal oil-producing states with Texas leading the list . . . 512 contractors who own 1,685 rigs. But other areas such as the Rocky Mountains are gaining in importance. Contractors are also putting rigs into the offshore operations, although the high costs and abnormal risks have deterred all but the most venturesome. Today over 50 rigs are running in offshore waters and the number is steadily increasing.

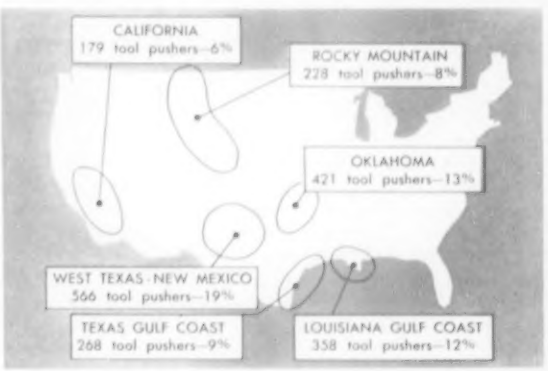
Seven States Dominate the Picture In Ownership of Drilling Rigs



Cities Where Control Is Concentrated

WICHITA	60 contractors 133 rigs
TULSA	69 contractors 525 rigs
OKLAHOMA CITY	58 contractors 167 rigs
LOS ANGELES - LONG BEACH	36 contractors 138 rigs
MIDLAND-ODESSA	53 contractors 205 rigs
WICHITA FALLS	77 contractors 212 rigs
FORT WORTH-DALLAS	67 contractors 302 rigs
SHREVEPORT	27 contractors 124 rigs
HOUSTON	81 contractors 326 rigs
OTHERS	634 contractors 1,613 rigs

Where Is the Concentration of Supervisory Personnel of the Rigs



80.5% CONTRACTORS ALSO OWN AND OPERATE OIL AND GAS WELLS

19.5% OF CONTRACTORS HAVE NO OIL OR GAS WELLS

935 contractors out of 1,162 total, also own and produce oil and gas wells; for over half of these, their producing activities are more important than their contract drilling activities. Of the remaining 227 contractors, most are endeavoring to develop production.

81% ROTARY RIGS OPERATED BY CONTRACTORS
19% ROTARY RIGS OPERATED BY OIL COMPANIES

About 19 per cent of rotary drilling done by oil companies operating their own tools (this varies somewhat in different parts of country). As deeper drilling trend continues, oil companies assume a greater and greater share of drilling risks, hence they are increasingly interested in type of equipment contractors use for them.

So You Want to ~~Acquire~~ Drill Your Own Oil and Gas Production?

. . . O. K., go to it. You'll need (1) exploration and land men, (2) a good drilling contractor, and (3) probably an oil loan

by Harold Vance
Vice President, Second National Bank, Houston.

THE romance of the oil business is attached to the direct ownership of the oil and gas.

Leasing . . . In the usual transaction, the landowner conveys to another person an oil and gas lease, which in Texas is a conveyance of, usually, seven-eighths of the oil and gas. The grantor in this case is known as the lessor, and grantee is the lessee. The lessee, or owner of the oil and gas lease, is charged with the development and operation costs of the property and the lessor retains unto himself one-eighth of all the oil and gas produced, free of all costs except production and ad valorem taxes on his retained interest. This retained interest is called royalty but is more properly known as landowner's royalty. The lessor and lessee usually have the right to sell part or all of their interest and often do divest themselves of part of it.

Overriding royalty . . . The lessee may create out of his interest an overriding royalty or production payment. The overriding royalty is part of the lessee's interest free of all costs of operation for the life of the lease, whereas the production payment is a similar interest limited to a specified amount of money or barrels of oil or cubic feet of gas.

The lessee is usually the operator of the property but he may be a nonoperating lessee owner. In this latter case there is an operating lessee interest owner who is operating the property for the benefit of his own interest as well as those who also own a part of the leasehold interest, and the ability of this person as an operator is important to the nonoperating lessee owner.

Knowledge of the oil business . . . In many cases the investor needs no operating knowledge of the oil business. For example, if royalty were purchased the investor would have nothing to do with the operations of the property and his advice would not be sought by the operator of the property; in fact, the operator would object very strenuously to receiving any suggestions from the royalty owner. If one purchased a nonoperating leasehold interest, there would probably be an operating contract which would cover any operations of the property. And the purchaser in this case would need have no direct knowledge of the oil business but could hire the services from time to time of consultants who do have knowledge of the oil business and could advise him as to the operations being conducted by his operating working interest owner. If one purchased part of the operating working interest, then some knowledge of the operations is important but, here again, competent help may be employed.

Acquiring Oil Interests Without Capital

We are concerned with how one having a knowledge of the oil business, especially the oil-finding and development phase, finally acquires an interest of his own without having any capital or credit with which to buy the interest.

Let us assume such a person is John Jones, who has had experience in locating favorable places for the drilling of a wildcat well. He is not presently employed and has enough finances to take care of his living expenses or has made arrangements with some other individual who will take care of these expenses for an interest in several ventures.

Jones has found a favorable location but does not have the leases nor does he have the money with which to purchase these leases. However, he is able to convince the owners of the mineral interests under eight sections of land that he can and will drill a well on one of the sections within 6 months. The various mineral owners each execute a lease and these leases are placed in escrow with the agreement that the leases be turned over to Jones when the well is drilled to a depth of 6,000 ft. or production.

Selling the deal . . . Jones now assumes the role of a salesman or he makes a deal with a salesman to sell his proposition. Let us assume that a drilling contractor, whose name is George Smith, is contacted and an agreement is finally reached whereby Smith agrees to give Jones $5,000 cash and drill a well and for this service, Smith will receive half the acreage with the well to be on Smith's acreage but an offset to acreage which Jones retains. This agreement is also placed in escrow along with the assignment from Jones to Smith for his acreage.

Smith is now ready to proceed with the drilling of the well if he himself is properly financed. Smith believes that he must treat all wildcat wells as dry holes so he proceeds to finance himself by selling interests in leases which he will thus acquire to other persons. He may also make an arrangement with other leasehold owners in the vicinity whereby they will give him so much money if the well is a dry hole. Smith may thus wind up with sufficient money to pay for the cost of drilling the well through this sale of acreage and still have entire ownership of the well and the 640-acre tract on which the well is located.

Oil is found! . . . The well just discussed will probably be a dry hole as most of

Which Is the Better Buy . . . Oil Royalty or Oil Stock?

SEVERAL years ago the writer purchased royalty in what is now Buffalo gas field in Leon County, Texas. This was landowner's royalty offsetting a shut-in gas well. The purchase price was $25 per royalty acre. (A royalty acre is the full one-eighth royalty under 1 acre. If you purchased 1 royalty acre under a 100-acre tract of land, you would receive 1/800 of the total production from the tract, free of all costs except production and ad valorem tax chargeable to the mineral interest.)

During this period, a local resident of the town of Buffalo was contacted; in fact, some mineral interests were purchased from him. At a later date he was asked if he knew of any more royalty for sale in Buffalo gas field. He stated he did not know of any presently for sale; but he had a royalty interest there which last year paid $50. He was offered $1,000 for this interest which was 5 per cent on his money. He thought this was pretty good. It was agreed that this was a fair return on his investment, but he was told he could buy Lone Star Gas Co. stock which would pay him 10 per cent and give him an interest in the same property as well as an interest in everything Lone Star owned. He looked puzzled and then said, "I did not know that."

Many people make unsatisfactory investments because they do not know what to invest their money in and when to make the investment. Since this conversation, Lone Star Gas stock has sold for almost four times what it was at that time. And during the same period, Lone Star's reserves have increased almost three times, but the value of his royalty interest has decreased and his gas reserves have been reduced.

There have been times when one could buy oil and gas in the ground cheaper through the purchase of stock in companies than by buying direct. A number of these companies have increased in value many fold in the past 10 years. For example, Louisiana Land & Exploration Co. stock once sold at $0.25. It has recently sold for $85 per share and the company's present known reserves are far in excess of what they were when the stock sold for $0.25 per share. Brokerage concerns from time to time publish information as to the cost of a barrel of recoverable oil owned by different companies, based upon the price of the company stock. Accompanying is a table prepared from information published by Merrill Lynch, Pierce, Fenner & Beane.

Many people object to acquiring an interest in oil by the purchase of corporation stock because they do not have any control over the management of the company. This is certainly correct, but sometimes the companies have better managers than we are ourselves. Double taxation on stockholders' earnings is another objectional feature.

A few years ago the writer served as one of the appraisers on the estate of a well-known man in Houston. This gentleman had amassed a large fortune; he owned royalty interests and working interests direct and through a corporation in which he owned the controlling stock. In addition to these two types of investments, he owned large blocks of stock in well-known oil companies. The value of his stock ownership in companies over which he exercised no control whatever exceeded the value of the property over which he exercised complete control and management. This man made money by managing his own properties and also made money by having top-flight management handle some of his properties.

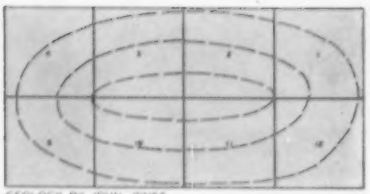
TABLE I — REPORTED OIL AND GAS RESERVES OF REPRESENTATIVE OIL COMPANIES[1]
(Domestic except where otherwise indicated)

(Portions of basic information obtained from circular published by Merrill Lynch, Pierce, Fenner and Beane, July 1955.)

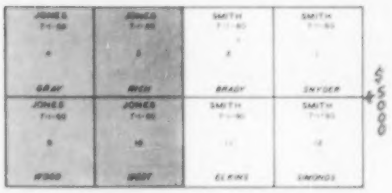
Company—	Date reported	Million barrels crude	Billion cu. ft. of gas	Gas equiv. in million bbl. crude .30 M.c.f. = 1 bbl.	Million bbl. crude reserves and gas equiv.	Total crude and gas equiv., bbl. per com. sh.	Per bbl. value, total crude reserves and gas equiv.	Approx. stock price, 7-15-55	Earnings per share (1954 or latest fiscal year)
Argo Oil	12-31-54	90.0	160.0	5.33	95.33	47.67	$ .61	$29	$2.14
Arkansas Fuel Oil	1- 1-53	147.1	685.9	22.86	169.96	44.71	.67	30	1.89
Atlantic Refining Co.	9-30-54	[2]484.0	[2]2,210.0	73.66	557.66	62.22	.61	38	[13]4.47
British-American Oil Co.	12-31-54	88.0	275.0	9.17	97.17	11.15	2.78	31	2.16
The Chicago Corp.	12-31-54	58.7	1,520.0	50.67	109.37	27.38	.80	22	1.51
Colorado Oil & Gas Co.	8-31-54	9.8	604.7	20.16	29.96	10.66	1.59	17	1.71
Columbian Carbon Co.	12-31-54	[3]15.0	[4]1,500.0	50.00	65.00	40.31	1.26	51	2.83
Continental Oil Co.	8-31-54	600.0	2,200.0	73.33	673.33	69.12	1.26	87	4.28
Cosden Petroleum Co.	4-30-54	17.1	16.7	.56	17.66	17.19	1.80	31	4.26
Delhi-Taylor Oil Co.	6-30-54	47.3	2,255.0	75.17	122.47	22.82	.61	14	.17
Drilling & Exploration Co.	6-30-54	[5]11.9	[5]20.3	.68	12.58	6.66	1.20	8	.64
General American Oil Co.	1- 1-55	[6]90.0	300.0	10.00	100.00	73.56	.82	60	5.49
Honolulu Oil	1- 1-53	[7]155.1	285.9	9.53	164.63	87.78	.90	79	5.46
Humble Oil & Refining Co.	12-31-54	[7]3,100.0	16,000.0	533.33	3,633.33	101.27	.92	93	4.08
Kerr-McGee Oil Industries, Inc.	3-31-55	[15]16.5	[15]833.0	27.77	44.27	25.26	1.82	46	[16]2.24
J. Ray McDermott	3-31-54	16.3	23.4	.78	17.08	8.59	3.26	28	1.86
Middle States Pet.	12-31-54	[2]37.6	[2]276.0	9.20	46.80	19.42	2.32	45	.93
Monterey Oil	7- 1-54	[17]114.1	[17]56.4	1.88	115.98	73.39	.46	34	.59
Ohio Oil Co.	9-30-54	[2]681.0	[2]2,110.0	70.33	751.33	57.26	.63	36	[17]2.91
Phillips Petroleum Co.	1- 1-53	[8][14]961.3	[8][15]3,221.0	440.70	1,402.00	92.47	.79	73	5.20
Shamrock Oil & Gas Co.	12-31-54	88.0	1,700.0	56.67	144.67	64.25	.65	42	4.93
Sinclair Oil Corp.	12-31-54	[7][11]711.5	1,700.0	56.67	768.17	57.33	1.01	58	6.04
Skelly Oil Co.	1- 1-53	351.0	2,300.0	76.67	427.67	74.44	.74	55	5.12
Socony Mobil Oil Co., Inc.	12-31-54	[9]1,630.0	[9]8,000.0	266.67	1,896.67	54.22	1.11	60	5.25
South Penn Oil Co.	12-31-54	37.5	65.3	2.28	39.78	24.65	1.46	36	3.14
Southern Production Co.	12-31-54	[2]61.8	[2]1,166.0	38.87	100.67	58.31	.53	31	2.41
Standard Oil Co. (Ind.)	12-31-54	[2]2,061.0	[2]11,380.0	379.33	2,440.33	75.18	.70	53	3.73
Standard Oil Co. (N. J.)	12-31-53	[10]3,260.0	[10]16,000.0	533.33	3,793.33	57.95	2.35	136	9.56
Sunray Mid-Continent Oil Co.	1- 1-55	394.1	1,948.0	64.93	459.03	27.95	.93	26	([18])
The Texas Co.	12-31-54	[9]2,121.0	[9]11,100.0	370.00	2,491.00	90.78	1.12	102	8.24
Tide Water Assoc. Oil Co.	12-31-54	[2]553.8	[2]2,180.0	72.67	626.47	57.24	.58	33	3.13
Union Oil Co. of Calif.	12-31-54	[2]537.5	[2]1,864.2	62.14	599.64	90.03	.60	54	5.26
Union Oil & Gas Co.	3- 1-55	42.1	1,474.0	49.13	91.23	50.93	1.18	60	1.70

1. Certain companies listed above have very substantial assets other than recoverable oil and gas, in that they have refineries, pipelines, and service stations. 2. Including foreign reserves. 3. Including Canadian reserves. 4. Owned and under contract. 5. Giving effect of Twin Oil merger. 6. After allowing for reserve necessary to retire production payment. 7. Minimum approximation. 8. Excluding tidelands. 9. Gross figure. 10. Including total holdings of companies in which Jersey owns more than 50 per cent of the shares but only that percentage of the holdings of other companies corresponding to Jersey's percentage of stock ownership. 11. After extinguishment of production payment on American Republic's properties. 12. Before consideration of substantial oil payments. 13. Includes nonrecurring profit (earnings covered foreign and domestic). 14. Owned only. 15. Developed only. 16. Includes nonrecurring profit. 17. Equivalent on new stock. 18. Merged May 16, 1955 (Sunray and Mid-Continent).

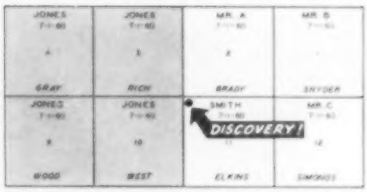
Here's a play-by-play description of how



STEP A . . . John Jones finds a promising structure and acquires leases under 8 sections of land subject to a well within 6 months.



STEP B . . . Jones turns the drilling deal to George Smith, drilling contractor. Smith gets leases under 4 sections, Jones gets $5,000 cash.



STEP C . . . Smith sells his interest in 3 sections to cover drilling costs. The well is a discovery with production from 5,820-30 ft.!

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them are, and we could stop this story. However, let us assume in this case that the drilling venture resulted in a good oil well, producing from 5,820-30 ft. Through the interchange of instruments held in escrow Jones acquires half of the acreage in the area. Smith, the drilling contractor, ends up with a fine producing well on 640 acres of land in which he owns the entire leasehold interest.

Other persons, to whom Smith sold leases, namely A, B, and C, own, in full, the leasehold interests in the other tracts which comprise the original half of the acreage Smith acquired for the drilling of the well. All the original mineral owners who executed the oil and gas leases in the first place have benefited by this venture and the value of their retained royalty interest has increased tremendously, and there is immediate income available to the owners of the royalty under the tract on which the producing well was drilled.

Drilling additional wells . . . This discovery makes necessary some added development. Under the terms of the usual oil and gas lease, Jones must drill a direct and a diagonal offset, and A must drill a direct offset. Further, after making an oil discovery, Smith is charged with development of his lease. This development program thus calls for a capital expenditure on the part of all the leasehold owners affected.

Let us first consider the case of Jones, the hero of our story. The value of Jones' retained acreage has increased in value and there is a ready market for any or all of his acreage. He has been looking forward for a long time to a discovery well of this type and now finds himself in a very favorable position. He may do one of two things, or both, insofar as his immediate requirements are concerned. He may sell one of the tracts on which an offset is required, using the money thus secured for development on the other tract on which an offset must be drilled.

Jones also could make a deal wherein the purchaser of a half interest in one or both of these tracts agrees to drill a certain number of wells free of cost to Jones for this half interest. Jones would share in the cost of operating the leases and also share in the cost of any further development wells on the property other than those covered by the initial agreement.

It might be well in either case for Jones to secure some money by the outright sale of one of the offset tracts. Bear in mind that it is entirely possible that an offset to Smith's well located on any of Jones' tracts could well be a dry hole which would disprove all of Jones' land. And he would end up with having missed the golden opportunity to make some money out of his venture. Here, again, the story would end insofar as Jones is concerned.

Development money needed . . . But in order here to continue our narrative, let's assume the field covers considerable area and Jones' venture proves to be profitable to him. Let us also assume that Jones does make a deal covering two sections, wherein the purchaser drills two free wells for a one-half interest. Jones must pay for his share of operating expenses and the cost of drilling additional wells. The initial wells are completed as good producers. Jones now finds himself with some oil-production income but the income from the present producing wells is not sufficient to pay his one-half of the costs of additional wells as they are drilled. He must borrow money from a lending agency and permit a part of the income from production to be applied towards retirement of the loan.

The only property of value which Jones owns is his interest in this oil property. Therefore, he must seek an oil loan. That is, the lending agency must look entirely to the value of his recoverable oil as a measure of the amount which it can loan and to the production of this reserve to pay off the loan.

Jones now seeks the advice of a bank having an oil and gas department and one that is familiar with his future problems. Jones is told that the bank is willing to make him a loan based on the value of his half interest under the two completed wells which is the value of his interests in the recoverable oil under 40 acres under each well. As additional development is contemplated, additional advances must be forthcoming to take care of the future wells as drilled. In this case, the bank suggests that Jones sign a note having a face amount in excess of the amount of money which he needs at this time in order that additional advances may be made under this same note. He is

THE AUTHOR

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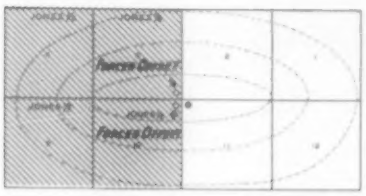
HAROLD VANCE

Harold Vance, vice president and manager of oil and gas department of Second National Bank of Houston, joined the bank's staff in 1952, following 18 years as head of Texas A. & M.'s petroleum engineering department. Vance graduated from University of Southern California in 1921 in petroleum engineering; and in 1939 he obtained his LL.B. from the Houston Law School.

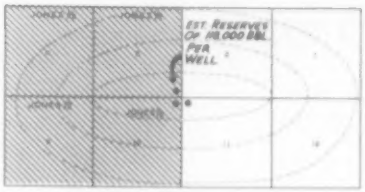
Vance spent 2 years with United Oil Co. of Los Angeles and 1 year with U. S. Bureau of Mines in Casper. He was associated with the early oil discoveries at Borger and Wink, Tex., and served as division superintendent with Marland Oil Co. and Continental Oil Co., from 1926 to 1929. He has been a consulting engineer and independent oil operator at Kilgore, and since 1934 when he went to College Station, continued these businesses.

Vance has written a number of technical papers and is the author of the book "Petroleum Subsurface Engineering" and coauthor, with E. L. DeGolyer, of "Bibliography of the Petroleum Industry."

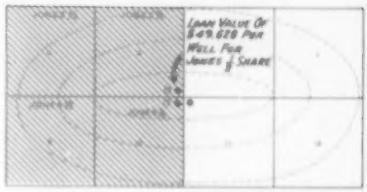
John Jones gets into the oil business



STEP D . . . Jones, faced with drilling two offsets to the discovery, sells half his interest in return for two wells, free of cost to Jones. He will, however, get half the oil from these wells. Both wells hit!



STEP E . . . Jones now has substantial assets in the form of oil reserves, his half interest in two producers. He contacts a bank for an oil loan.



STEP F . . . Bank's oil and gas department looks over property and will lend Jones initially $99,256 to cover his drilling costs. Ultimately they will lend him one million dollars. Jones is in the oil business!

also advised that the face amount of the note means no more than that; it does not mean that he can borrow now or at any time up to the face amount of the note, but through the drilling of additional wells the bank will revalue the security and, if general conditions warrant it, additional money will be advanced as his security increases.

Jones is also advised that the valuations will be made on a well-to-well basis; that is, 40 acres surrounding each well will be considered proven by a new well until such time as the development proves the area between the widespread locations. At this latter time, the entire proven area will be valued and additional wells drilled by Jones in the proven area would add nothing to his security because a value had already been placed on this area in preparing the final valuation.

Interest on loan . . . Jones is told that no interest will be charged except on the amount of money which he actually owes at any one time. Further, he can repay his loan at any time without penalty. Since the subject of interest has been brought into the conversation, Jones is interested as to what rate the bank would charge him for such a loan. The interest charged on any loan is a matter of negotiation between the borrower and the lender.

But it does not take long for an agreement to be reached because Jones is an oil man and he would not spend much time arguing over one-half of 1 per cent interest rate when he would not consider going into any oil venture unless he could see a 100 per cent profit. And his interest charges are deductible. However, Jones is told that the deposits he maintains at the bank are a consideration in arriving at his interest charge. Jones can readily see that under these conditions he would actually be borrowing some of his own money and thus would be entitled to a much lower interest rate. He is also told that an oil loan of the type he is requesting costs the bank more money than a loan on government bonds because of continual advances and revaluations of his security.

Amount of the loan . . . Jones is now concerned as to how much the bank will lend and how the bank arrives at the amount. He is informed that the bank engineer will make an appraisal of the property. This appraisal will involve a determination of the ultimate future recovery of oil and gas from the property and the rate at which this oil and gas will be recovered. No value will be placed on any sand not presently producing. In this particular instance, it will be necessary to determine the volume of productive sand and the recoverable gas and oil in this particular sand under the 40-acre tract on which each well is located.

With this data and an expected future price for the oil and future operating costs, one may arrive at the future yearly net income from oil and gas production until the property has finally reached exhaustion. Thus, we would have a series of yearly net incomes from the property each of which must be multiplied by a present-value interest-discount factor. Adding up the present value of the yearly incomes, one would arrive at the total present value of the property. Assume that a 5 per cent present-value interest-discount factor was used. Then the sum total of the yearly present value figures would simply mean that if one purchased the properties for this total figure, the purchase price would be returned plus 5 per cent interest. Of course, this is no measure of the fair market value of the property because no oil operator would purchase a property expecting to receive only his money back plus 5 per cent interest. The particular lending agency Jones has consulted agrees to lend 50 per cent of this present value figure with the loan repayable out of 92 per cent of the gross income from the properties. Table 1 is a sample valuation conforming to the above discussion. The estimated ultimate recovery per well was found to be 118,000 bbl. and the rate of recovery as shown in Table 1.

Lender protected . . . The lending agency believes it is amply secured by using this method of arriving at the amount to loan, because:

TABLE 1—DETERMINATION OF PRESENT VALUE OF FUTURE NET INCOME FOR ONE WELL

Year	Est. gross prod., bbl.	⅞ prod., bbl.	Est. future price of oil	Gross income*	Est. future operating expense	Net income	Pres. val. discount factor, 5 per cent	Present value
1st	40,000	35,000	$2.50	$87,500	$5,000	$82,500	0.9756	$80,487
2nd	26,400	23,100	2.50	57,750	5,000	52,750	0.9286	48,984
3rd	17,400	15,225	2.50	38,062	5,000	33,062	0.8839	29,224
4th	12,000	10,500	2.50	26,250	5,000	21,250	0.8413	17,878
5th	8,400	7,350	2.50	18,375	5,000	13,375	0.8007	10,709
6th	6,000	5,250	2.50	13,125	5,000	8,125	0.7621	6,192
7th	4,400	3,850	2.50	9,625	5,000	4,625	0.7254	3,355
8th	3,400	2,975	2.50	7,437	5,000	2,437	0.6905	1,683
Total	118,000	103,250		$258,124	$40,000	$218,124		198,512

Present value of expected production from one well for full ⅞	$198,512
Present value of expected production from one well for ½ of ⅞	$99,256
Loan value = ½ of present value	$49,628

*Value of gas not considered.

1. The property could be sold at any time for more than amount of loan.

2. There is twice as much expected income from property as is needed to pay off the loan.

3. The loan will pay off in about 15 months.

Jones has no difficulty in understanding the formula and procedure followed.

The valuation shows that the present value of Jones' one-half working interest in one well is $99,256. This means that Jones can borrow $99,256 on his one-half interest in the two wells. It also appears that until final development of the property, it will be necessary to advance $1,000,000 toward development of the property. This means that the master note should have a face amount of $1,000,000. Since the third well is now drilling on the property, Jones is expecting soon to receive a bill for his one-half of the cost of this well which will be in the neighborhood of $25,000. Jones will be required to sign the note and execute a mortgage on his interests in the lease. This mortgage is also a chattel mortgage on the equipment used in producing the oil and located on the property. It also contains a 100 per cent assignment of the oil runs from the property in favor of the lending agency. It has already been agreed with Jones that the bank will not take 100 per cent of his runs, so a loan agreement signed by both parties is to be drawn up to indicate that the runs applied toward repayment will be 92 per cent, with a minimum payment as indicated in the memorandum covering the application.

Proof of title must be made available to the bank in order that the bank's attorneys may be satisfied that the title to the interest being mortgage stands in Jones' name at this time. After all the papers have been drawn and executed, an immediate advance of $25,000 is made and deposited to Jones' credit. After the completion of the third well, the value of this well is determined and this value is added to the value already shown for the two completed wells. Assuming that the value for the third well is the same as for the other two wells, then Jones has a value of some $290,768 which means that he can borrow up to one-half this amount. Thus, he has plenty of security to borrow money for the further development of these wells without the bank going to the trouble of revaluing each well as it comes in until the security has finally been used up. With sufficient security available for future advances, at Jones' request, the bank will deposit to his account money up to this limit. When development is finally completed, Jones finds himself with a debt being liquidated out of production.

✓ SLIM-HOLE DRILLING

Slim Holer Doubles in Brass

Combination rig drills both strat tests and 4,000-ft. wells. Costs are cut 40 per cent

SUTTON DRILLING CO., of San Antonio, has developed a new approach to oil exploration using a slim-hole rig. Its rig was developed for the specific purpose of core drilling a structure on shallow beds (within 300 ft. of the surface in some cases). Once a structure is located and defined by the core drill, Sutton uses the same string of tools to check possible producing reservoirs down to a depth of 4,000 ft.

This approach has a real future with the independent operator who cannot afford expensive seismic work. According to W. F. Sutton, president of Sutton Drilling Co., footage costs are about 40 per cent lower with its slim-hole rig down to depths of 4,000 ft. than with any other comparable method of drilling a well. The rig is equipped with wire-line coring equipment should an operator deem coring necessary. In its program to date, however, Sutton has drilled down and taken side-wall cores when structural conditions are favorable.

Sutton's rig combines as many of the desirable features of a seismic rig as possible along with the size and ruggedness to drill a well to deeper depths at high speeds. It has its own logging unit and can be set up ready to drill in only 90 minutes. Tear-down time has been clocked at 1 hour.

Equipment . . . Sutton's rig, called the Pathfinder No. 6, is mounted on a 10-ton tandem Reo truck. It is powered by a single G.M.C. 671 diesel engine; the pump is a 710 Wheatley. The draw works was designed especially for the rig by Sutton Drilling Co. and is rated at 4,000 ft. plus. The derrick is a 65-ft. mast of tubular steel with a 150,000-lb. rating.

The unit has 4,000 ft. of 2½-in. J-55 tubing, equipped with tubing tool joints and also carries two 4¾-in. by 30-ft. drill collars. It is being used primarily in the Carrizo - Wilcox Trend where drilling penetration rates are generally high. It has a maximum penetration rate of 100 ft. per hour with an average, from top to bottom on 2,500-ft. hole, of 60 ft. per hour.

This rig moved on location July 12, 1955. It has drilled a mixture of deep and shaliow core tests and at the present time is drilling one shallow field well in the Scotty field, Wilson County, Texas. In 42 days' time it has drilled 11 wells for a total of 19,100 ft. Some of these wells were for a major company and were wire-line cored extensively.

Sutton believes that in the Southwest Texas area the great oil fields that remain will be of the stratigraphic trap type. These of course are deceptive and hard to find. In fact the only known method of finding them is by drilling. Therefore, tools such as these will allow more wells to be drilled in search of oil fields of this nature.

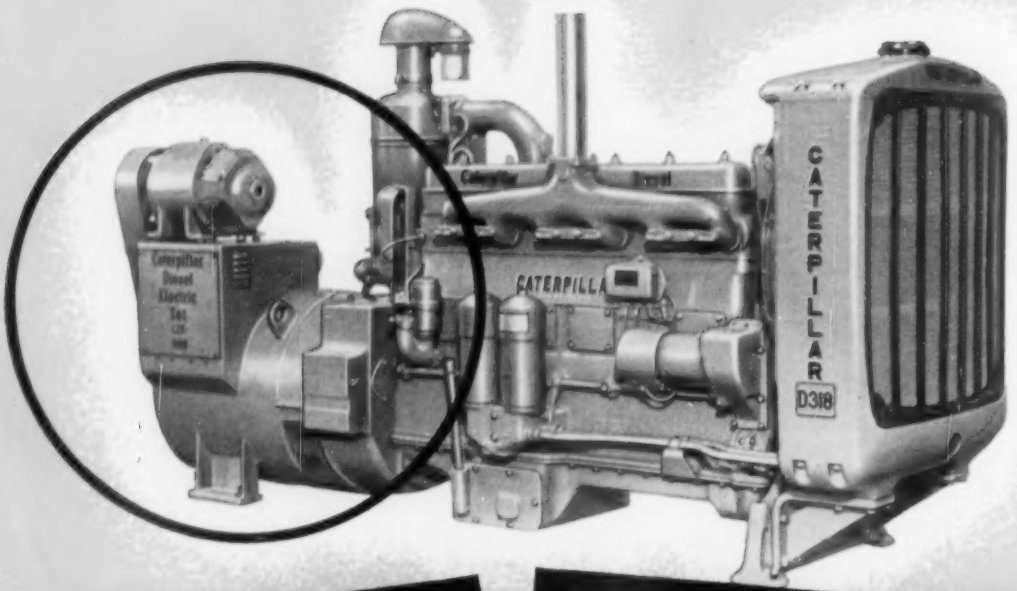
Visco

CONSISTENTLY EFFICIENT OIL FIELD CHEMICALS

The NEW

CATERPILLAR

... A major development in

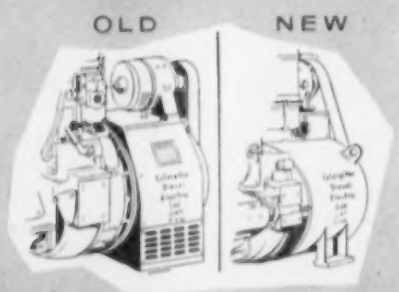


Nothing like it for simple operation, flexible application, compact power, rugged construction, long life and ease of maintenance.

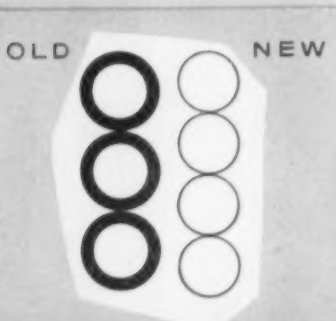
Heart of the new line of Cat Diesel Electric Sets, providing in one package the best features of self-regulated and externally-regulated generator plants—you get more for your money.

Easily paralleled with other generators now in use.

There is a big difference in size between the old and new Caterpillar Generators.



New insulation permits more compact design—exaggerated comparison in illustration below.



New design saves space. Leads can be taken from side, back or top without affecting machine width.

GENERATOR

modern electric power

MAJOR ADVANTAGES OF THE NEW CAT GENERATORS

1 **MATCHED TO ENGINE PERFORMANCE.** Each Cat Generator is designed and built to exactly match the Cat Engine powering it, assuring maximum efficiency in a simple, complete package.

2 **SELF-REGULATING, WITH CLOSE VOLTAGE REGULATION.** Designed to meet the needs of applications now served by self-regulated or externally-regulated generators, this new generator provides steady voltage from no load to full load.

3 **ADJUSTABLE FOR SPECIAL CONDITIONS.** During initial installation, the terminal voltage and voltage "droop" can be adjusted to meet the special conditions of the application. After that, the adjustments are locked and no further adjustments are necessary.

4 **EASY TO INSTALL.** No complicated switchgear or external voltage regulators are needed.

5 **VERSATILE IN APPLICATION.** Easily paralleled with other generators now in use.

6 **SMALL AND COMPACT.** Occupy less space than other generators. A reduction in frame size, close coupling, top-mounted exciter results in a shorter over-all package length.

7 **BIG ELECTRICALLY.** Motor starting ability — capacity to handle the surge of heavy loads.

8 **EASY TO MAINTAIN.** Heavy-duty, single-bearing, close-coupled construction. The single bearing is easily accessible and is lubricated from an oil reservoir that requires filling only once a year.

9 **RUGGEDLY CONSTRUCTED.** Heavy-duty, laminated pole rotor for improved operation and increased rotor life.

10 **DESIGNED FOR LONG LIFE.** Built to match the long life of the Caterpillar Engine powering them.

Another example of Caterpillar leadership in action!

In 1939, Caterpillar introduced the first Cat* self-regulated Electric Set.

Like most new developments, it had to win acceptance against "old, hidebound, traditional practices and prejudices."

It won acceptance – quickly and with outstanding success.

Now Caterpillar introduces another new concept in diesel-electric power – a new and better generator.

Combining the latest developments in design, materials and production, it gives Caterpillar's new line of Diesel Electric Sets the efficiency of the externally-regulated generator in a self-regulated set. And you get more for your money.

These power packages are 100% backed by Caterpillar and sold and serviced by one reliable source – your nearby Caterpillar Dealer.

Whatever your power requirements, it will pay you to look into the new Cat Diesel Electric Sets with their new advance-design generators. See your Caterpillar Dealer about them today!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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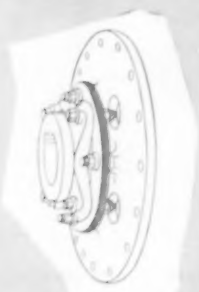
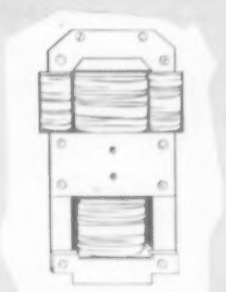
NEW HEAVY-DUTY ELECTRIC SETS

Disc-type coupling and single-bearing design save space. Single bearing is easily accessible.

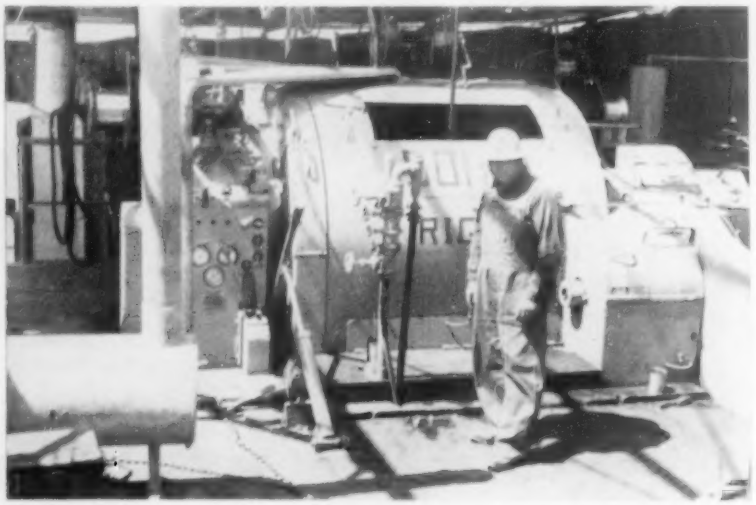


The "regulator" of the new Caterpillar Generator. No moving parts — compact — reliable.



The control panel — adjustments locked at installation. No further attention required.

OLD Eight hours of drilling the tough Eola field wells completely exhausts Sohio's drillers and reduces their efficiency.



NEW With automatic feed control, drilling operations can be carried out with no one on the rig floor. Here, W. B. Driver, driller on Sohio Rig 22, demonstrates his safety brake. Air cylinder is shown between draw-works brake handle and rig floor.

When drilling is tough, penetration slow, and formations thick and uniform . . . that's

When to Use Automatic Feed Controls

by John H. Atwood
Sohio Petroleum Co.

AUTOMATIC feed controls find their best application on rigs operating in the fields where the drilling is difficult and the penetration rates are slow, and where the major portion of the geological formations penetrated are thick and uniform.

Soon after completing the discovery well in Eola pool, Garvin County, Oklahoma, Sohio Petroleum Co., the principal operator, realized that there was a possibility of using the automatic driller to advantage in the development of this field where the pay zones are deep and the formations thick. A hydraulic feed control was installed on one of the company rigs. And the gratifying results of actual tests obtained made the installation of automatic drillers on the other Sohio rigs imperative.

Offset wells . . . The problem of analyzing the value of a piece of equipment such as an automatic feed control to drilling operations is difficult in Eola due to the complexity of the structures penetrated and the variability of the drilling problems found in each well. However, some important data were obtained on two offset wells drilled by the same rig—one well with the driller installed and the other without the use of the driller.

As shown in Table 1, the feed control definitely increased the penetration rates in the uniform limestones and shales. The savings due to the increased penetration rates through an 800-ft. lime section alone amounted to $3,900 in rig time. However, in the deeper formations, lime intermingled with shale and thin sand beds with lime and shale stringers, the automatic driller did not perform as well as manual feedoff operations.

Improved performance . . . Due to the favorable results realized by Sohio, a contractor drilling two offsetting wells

TABLE 1

	Well "A"			Well "B"		
	Manual feed-off control			Automatic feed-off control		
Formation—	ft./hr.	ft./bit	maximum deviation change	ft./hr.	ft./bit	maximum deviation change
Lime and shale	2.87	55.5	2¾°	3.33	58.3	1¾°
Limestone	2.07	53.2	1½°	2.61	77.0	¾°
Shale	2.40	66.3	3¼°	2.62	59.0	½°
Limestone	1.69	48.6	3¼°	2.42	51.2	2¾°
Lime intermingled with shale	1.93	72.6	3½°	1.92	51.8	3°
Thin sand beds with lime and shale stringers	2.00	31.7	3½°	1.89	40.2	2°

TABLE 2

	Well "C"		Well "D"	
	Manual feed-off control		Automatic feed-off control	
	ft./hr.	ft./bit	ft./hr.	ft./bit
Lime intermingled with shale	2.62	89.3	2.92	96.0
Thin sand beds with lime and shale stringers	2.20	27.4	2.15	24.6
Sand and lime	1.47	36.2	2.18	71.3
Hard sand	1.17	10.1	1.36	23.7
Lime intermingled with shale	2.30	56.1	2.28	55.7

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installed an automatic driller during the operations on the second well. While this control was installed after the second well had been drilled below the more uniform upper formations, the drilling rates and bit records tabulated verified the fact that the automatic feed controls offered a greater advantage in the uniform sections than in the broken formations. These results are shown in Table 2.

In addition to Sohio's three rigs, four of the contractors drilling in Eola have installed automatic drilling controls. These contractors have reported faster penetration rates and more efficient bit service while drilling through the uniform formations. Maximum efficiency has been obtained while drilling 18 to 20 ft. per hour. One contractor reports that penetration would have been practically impossible through one particular section without automatic feedoff since a maximum 2,000 to 3,000-lb. weight on the bit was necessary to prevent increased hole deviation.

Advantage in coring . . . In Eola, where the geology consists of complex faulting, overturned formations, and variable dips, core analysis is very important. Therefore, most of the operators cut cores in the shallow sands, Hunton lime, and Simpson group pay zones. By maintaining a constant weight on the core head, a uniform penetration of the hard formations as well as the unconsolidated sands is obtained; and this results in maximum recoveries and more economical coring operations. A comparison of the full and perfect cores recovered from the core barrels on Sohio's rigs and on the contract rigs employing the automatic drillers versus the broken cores with sections missing obtained from the rigs on which manual feedoff was required will verify this advantage of an automatic control.

THE AUTHOR

John H. Atwood is engineer for Sohio Petroleum Co.'s Oklahoma district at Pauls Valley. The majority of his duties are directly connected with the company's drilling operations. He is a graduate of Purdue University, class of 1951, with a degree in mechanical engineering. He started to work for Sohio in Illinois and has had considerable experience in production, completion, and drilling engineering work.

On the first well drilled after installing the original control, 1,270 ft. of core was recovered from the 1,290 ft. actually cut. The binding action of the core in the barrel due to overloading the bit and letting it drill off was eliminated. By eliminating this binding and fouling action inside the barrel, many expensive round trips from 10,000 to 11,000 ft. were saved.

Straighter holes . . . In addition to the increased penetration rates and greater bit life realized, data were obtained on the offset wells mentioned above which shows that the use of automatic feed control results in a straighter hole being drilled in this extremely crooked hole country. While maintaining the same weight on the bit, 12,000 lb., in the Sylvan shale, the hole drilled with the aid of a feed control maintained the same direction with only ½° variance in deviation while attempts to maintain the 12,000-lb. weight in the preceding well had resulted in three direction changes and a 3¼° deviation variance through the 150-ft. shale section. This ability to drill a straighter hole has been proved in other formations in practically every section of the field.

On top of these proved advantages, the automatic feed control allows the driller to attend to necessary duties around the rig while drilling operations continue. It relieves driller fatigue and increases reaming efficiencies. There is some question that the use of the feedoff control eliminated drill-pipe twistoffs in Eola.

The problem of checking drill-pipe failures at Eola remains unsolved. Most of the failures occur while drilling the rough conglomerate section between 2,500 and 4,000 ft. These failures are not a true twistoff resulting from sudden, excessive torque. The accepted theory is that the breaks are due to a bending action caused by the intermittent tension and compression forces resulting from the drilling in this nonuniform conglomerate section.

Operating expenses on the hydraulic feed controls are practically nil. Most of the failures and damages relative to any of the units which have been in operation from 3 to 8 years can be traced to carelessness or faulty operation of the auxiliary equipment. Worn or inadequate chain failures and accidental clutch engagement during a trip have been the main source of damage.

Safety brake . . . One of the Sohio drillers designed and patented a safety brake to be used in conjunction with the drilling control. During normal drilling operations while the automatic driller is being used, a small wheel directly connected to a conical pendulum-type governor is placed in contact with the draw works drum flange. The outward movement of the governor weights caused by a slight increase in drum speed opens a valve in the 150-psi. rig air system. When the valve is opened, compressed air expands through the valve acting on a piston in an air cylinder, which in turn sets the drum brake, normally operated manually. Installation of this safety brake has eliminated the damage resulting from pin or link failure on a worn drive chain between the automatic driller and the line shaft on the draw works. The brake also allows the driller and entire crew to be working off the floor during normal drilling operations.

Results very satisfactory . . . While automatic drillers have never been generally accepted by the industry, the more efficient drilling operations in Eola pool as a result of the utilization of automatic feed control serve as a yardstick for the proper application for these units. At Eola the drilling controls have definitely helped to reduce drilling costs due to:

1. Faster penetration rates through the uniform formation.
2. Straighter holes.
3. Longer bit life.
4. Economical coring and reaming operations.

In addition, the feed off control has lessened driller fatigue.

An important factor in the efficient operations of these units has been the experience gained over the years by the drillers. This plays an important role in the proper regulation of the rate of feedoff through the different geological formations.

One of the contract tool pushers at Eola summarized his thoughts on the usefulness of the drilling controls with this statement: "To drill an Eola well without the aid of an automatic driller after having drilled a well with one would be like being transferred to an office without an air conditioner after having worked in one with air conditioning."

"This ability to drill a straighter hole has been proved in other formations in practically every section of the field."

No valve maintenance after 3 years' service —even with traces of HF acid

THE CASE HISTORY—This installation is at Continental Oil Company's Ponca City refinery, on their HF alkylation unit.

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AIR OR GAS DRILLING has reduced drilling costs appreciably in Pennsylvania. Contractors have been able to drill the entire hole with either air or gas.

Pennsylvania has been experimenting with

Air-Gas, Top to Bottom

". . . These methods appear to be the brightest cost reducer on the drilling horizon."

by H. J. Magner
Delta Drilling Co.

AT present air, gas, and aerated-mud drilling are in their basic stages. Much of their potential has yet to be discovered. Experimentation and research in all phases of drilling technique and associated equipment should result in even greater progress.

Well-cost economics may force adoption of one or all of these techniques in given areas; widespread usage will reflect continued improvement. In Pennsylvania, footage rates have been reduced 25 per cent through air drilling; other areas may achieve similar or even more reductions.

Actually this is a new tool by which rotary drillers can better conquer the problems of formation penetration. With the advantage of lower costs, these methods are bound to take their place in the drilling techniques of tomorrow.

During the past 15 years, the elements of cost to the drilling contractor have more than doubled. Recent increases in rig labor and steel prices indicate additional burdens to be borne by the contractor. However, drilling charges to the operator have remained constant, on the average. Increased penetration rates have been the most important factor in the stabilization of the footage rates. Recent developments in air, gas, and aerated-fluid drilling have reflected further appreciable increases in penetration rates.

And these methods appear to be the brightest cost reducer in the drilling horizon.

Since the discovery of oil in Pennsylvania, cable tools have drilled practically all the wells, shallow and deep, in the Appalachian basin. The general absence of water-bearing formations at depth makes this basin ideal for the tools, but it also makes excellent proving grounds for rotary air drilling. Some of the experiences and data encountered during 18 months of this new technique are herein related.

Appalachian Air-Gas Developments

Many wells have used air or gas methods in a portion of the total hole, but there have been few areas that can be drilled from the ground level to completion without the use of a drilling fluid. In this discussion the air-gas drilling will be broken down into three phases; these are surface hole, production-string hole, and gas completions. Too, the wells from which these data are gathered are located in the Pennsylvania sector of the Appalachian basin.

Surface hole . . . This actually consists of a conductor hole, approximately 30 ft. in depth with 13⅜-in. casing set therein, and the regular surface hole

which utilizes from 600 to 1,000 ft. of 9⅝-in. casing. Since the formations to this depth are predominantly sandstone, this section of the hole is proving difficult to conquer. The conductor hole (and rathole) haven't been too difficult because of their shallow depths. But air methods have reduced their drilling time substantially.

In the surface hole, waters are encountered at various intervals and lost-circulation zones usually exist if fluid is used. However, recent wells have employed from 2,400 to 3,000 cu. ft. of air per minute through the 12¼-in. surface bit with excellent results. This volume, when put through the fifteen 6¼-in. drill collars and 4½-in. pipe, was sufficient to carry out **all of the water** entering the hole, along with the cuttings. Since the hole is open to atmosphere, lost-circulation zones cease to be a problem. The rock-bit nozzles were cut out to allow maximum volume to pass and also reduce pressure requirements of the compressor. To further speed the surface hole operation, fast setting cements were used on the conductor and water strings.

Experiments were made with a pulldown arrangement to achieve more weight on the bit at shallow depths. This seemed to be a valuable assist, and it is believed much study could be given to the use of hydraulic pulldowns in this type of drilling. Shallow core-drilling rigs employ a pulldown with much success, so there is no reason the larger rigs can't use such to advantage. Actually, there seems to be no reason why equal penetrations cannot be achieved in large holes so long as the same weight per square inch of bit is applied and the cuttings are removed with the same return velocity. A fluid-air comparison bit record is shown in Table 1.

Production string hole . . . This phase of air drilling has been the most spectacular in its development and results. This section of the hole extends under the surface to 8,500-ft. depths. Standard size hole is 8¾-in., and the same 15 collars and 4½-in. drill pipe are used. Various experiments with air requirements were made, but the key feature is actually the return velocity developed. It appears 3,000 ft. per minute is the desirable rate of return for the air and cuttings. In hard sand and lime formations a lower rate seems satisfactory, while the fast drilling shales require greater volume and return velocities to achieve maximum penetration with ample cutting removal.

GAS DRILLING in progress. Dust pile in back of "burn pots" was the accumulation of air-drilling cuttings.

Because of availability of portable compressors, three 600-cu. ft. per minute units are normal for this section of the hole. Pressure requirements vary from 50 to 200 psi. However, it is evident that use of the excess rig horsepower for air production is most desirable. A few stationary units are in operation now and they have many advantages over portables; but the latter type has a place in the drilling picture to supply additional air when required.

Caution must be exercised in engineering a stationary compressor unit to fit a given rig. Mud pumps have horsepower variations with liner sizes, but compressors require continuous out-

TABLE 1—COMPARISON OF FLUID-DRILLED AND AIR-DRILLED SURFACE HOLES

BIT RECORD OF ONE OPERATOR'S FLUID-DRILLED SURFACE HOLE IN GREENLICK POOL, PENNSYLVANIA

Bit No.	Type 12¼-in. bit—	Footage From	Footage To	Footage drilled	Time (hr.:min.)	Ft./hr.
1	New	29	215	186	44:35	4.19
2	New	215	250	35	6:35	5.51
3	Retip	250	358	108	16:47	6.56
4	Retip	358	469	111	15:33	7.24
5	Retip	469	510	41	9:02	4.55
6	Retip	510	535	25	6:25	4.00
7	New	535	597	62	11:13	5.57
8	Retip	597	615	18	4:07	4.42
9	New	615	658	43	9:48	4.54
10	New	658	727	69	14:22	4.85
11	New	727	841	114	25:05	4.55
12	New	841	915	74	16:02	4.62

SUMMARY DRILLING DATA

179.57 hours on bottom. 74 ft. per bit. 4.94 ft. per hour penetration.

BIT RECORD OF ONE OPERATOR'S AIR-DRILLED SURFACE HOLE IN GREENLICK POOL, PENNSYLVANIA

Bit No.	Type 12¼-in. bit—	Footage From	Footage To	Footage drilled	Time (hr.:min.)	Ft./hr.
1	Retip	32	465	433	30:47	14.21
2	Retip	465	535	70	6:50	10.77
3	New	535	897	362	17:52	20.66

SUMMARY DRILLING DATA

55.48 hours on bottom. 288 ft. per bit. 15.64 ft. per hour penetration.

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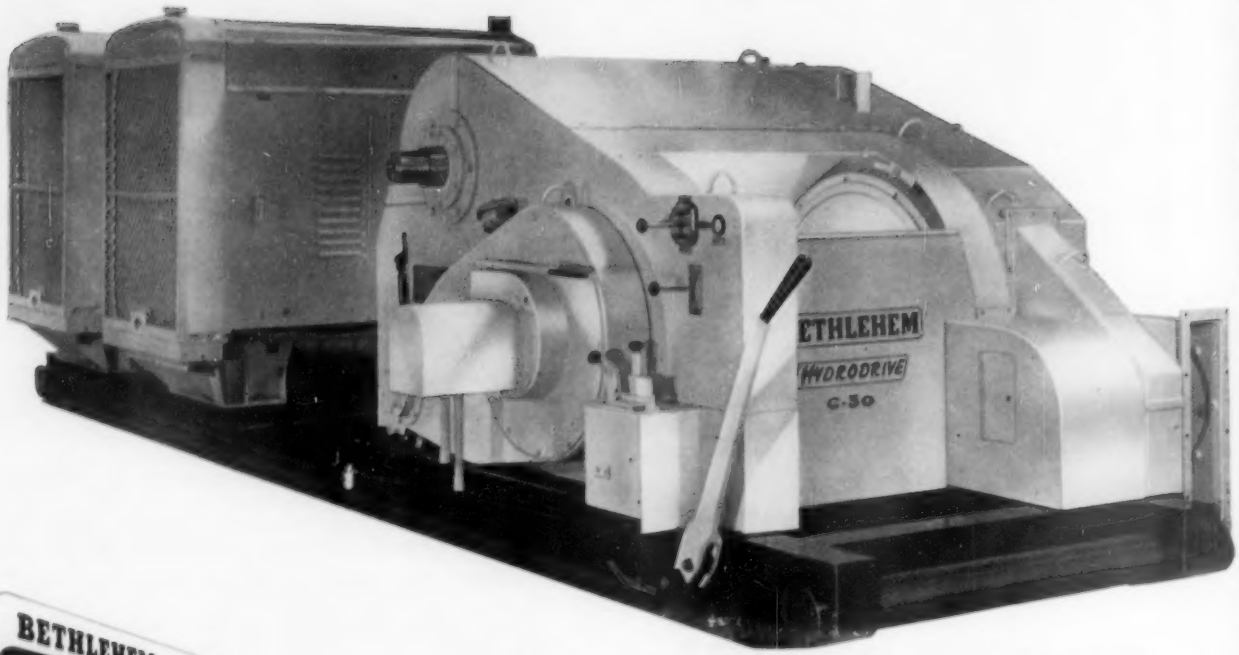

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This is a rig with torque-converter drive—a drive that cushions all shocks, protects vital working parts, and automatically adjusts speeds for any given load. It is a drive that makes possible faster trips and provides complete control for drilling operations. The torque-converter can be engine-mounted or placed amidship, whichever you choose.

Other C-50 features are equally outstanding. This is a rig that is built to stand the gaff. Parts are extra-heavy, extra-strong. The unit has short, rugged shafts, sturdy roller bearings, oil-bath chain drives, high-capacity air-friction clutches, and oversized brakes. The brakes are fully water-cooled by a forced-circulation system.

Optional items include upper drum, hydromatic brake, and gear-type reverse. An intermediate forward speed (making three in all) can be substituted for the reverse drive. This third speed is especially advantageous whenever slush-pump drive is furnished with the compound.

Though the C-50 is built for the heaviest service in its drilling range, it is designed for easy moving. Low and very compact, it is readily adaptable for trailer mounting. It is equipped with skids when a conventional installation is desired.

You are invited to study this rig and its many excellent features. If you will call or write, we will gladly go over it with you, point by point.

TABLE 2—COMPARISON OF FLUID-DRILLED AND AIR-DRILLED PRODUCTION STRINGS

UNDER SURFACE BIT RECORD OF ONE OPERATOR'S BEST MUD-DRILLED WELL IN BENZETTE FIELD, PENNSYLVANIA

Bit No.	Type 8¾-in. bit—	Footage From	Footage To	Footage drilled	Time (hr.:min.)	Ft./hr.
1	A	884	1,076	192	11:57	16.0
2	A	1,076	1,255	179	10:01	17.9
3	A	1,255	1,360	105	6:40	15.75
4	A	1,360	1,450	90	4:15	21.17
5	A	1,450	1,553	103	6:41	15.45
6	A	1,553	1,655	102	5:57	17.00
7	A	1,655	1,755	100	6:12	16.15
8	A	1,755	1,881	126	6:18	20.16
9	A	1,881	2,037	156	8:17	18.90
10	A	2,037	2,160	123	7:59	15.37
11	A	2,160	2,339	179	10:36	16.88
12	A	2,339	2,425	86	5:55	14.55
13	A	2,425	2,495	70	5:48	12.08
14	B	2,495	2,600	105	9:53	10.62
15	A	2,600	2,840	240	12:25	19.35
16	A	2,840	2,960	120	6:46	17.79
17	A	2,960	3,064	104	9:23	11.06
18	A	3,064	3,145	81	6:19	12.85
19	A	3,145	3,250	105	8:00	13.15
20	C	3,250	3,443	93	8:21	11.11
21	C	3,443	3,495	152	11:58	12.68
22	C	3,495	3,638	143	10:23	13.75
23	C	3,638	3,830	192	12:01	16.00
24	D	3,830	4,030	200	10:11	19.65
25	D	4,030	4,193	163	10:23	15.68
26	E	4,193	4,302	109	7:29	14.52
27	D	4,302	4,680	378	18:42	20.20
28	D	4,680	4,990	310	16:50	18.45
29	D	4,990	5,647	657	29:03	22.60
30	F	5,647	6,117	470	21:54	21.42
31	E	6,117	6,381	264	12:42	20.80

SUMMARY DRILLING DATA

319.32 drilling hours on bottom. 177.5 ft. per bit. 17.15 ft. per hour penetration.

UNDER SURFACE BIT RECORD OF ONE OPERATOR'S BEST AIR-DRILLED WELL IN BENZETTE FIELD, PENNSYLVANIA

Bit No.	Type 8¾-in. bit—	Footage From	Footage To	Footage drilled	Time (hr.:min.)	Ft./hr.
1	C	690	815	125	6:00	20.8
2	B-1	815	2,995	2,180	69:30	31.4
3	B-1	2,995	6,536	3,541	97:00	36.5

SUMMARY DRILLING DATA

172.5 drilling hours on bottom. 1,907 ft. per bit. 33.2 ft. per hour penetration.

Type bits:
A—Hard abrasive formation—jet type.
B—Hard abrasive formation—maximum resistance to gage wear—jet type.
C—Hard abrasive formation.
D—Medium hard formation—jet type.
E—Medium hard formation—jet type, for shales and limestones.
F—Unconsolidated, medium rock formation—jet type.
B-1—Tungsten carbide insert.

put. A rule of thumb might be stated that a rig can effectively pull a compressor equal to one-half the rated engine horsepower.

Rock bits have been a big factor in the astounding results in penetration with air. Since high return velocities provide for a clean bit at all times, the rate of penetration becomes a product of the bit versus formation hardness. Tungsten bits are most effective in hard sands; runs of 1,500 to 4,000 ft. per bit have been made, and 106 rotating hours on bottom have been recorded on a single bit. Shales are drilled with any type bit, but the short-toothed variety seems best since in stays in the hole longer and maintains better gage. Experiments are in progress as to the most effective nozzle size as well as the advantages of air ports to the bearings. Large nozzle openings reduce air-pressure requirements for the desired volume, but apparently a cooling pressure drop across the bit makes for longer bearing life.

The ideal air bit may never be found, but results being obtained with the present product are fantastic when compared with fluid accomplishments.

Operating problems . . . The rotating drilling head is most valuable in keeping the dust away from personnel and equipment. Minor attempts have been made to eliminate the dust at the end of the flare line with some success. If air drilling occurs in populated areas, this dust condition will have to be eliminated. Water injection into the flare line, dust discharge into the water-filled pit, and commercial dust collectors hold the best promise as solutions to the problem.

Despite the appearance of sandblasting, the air cuttings apparently have far less wear on drill pipe than fluid. One string of pipe with 100,000 ft. of hole reflects a tool-joint wear of less than ⅛ in. There is not enough experience to note fatigue in the metal. The answer to so little pipe wear appears to be because of the low pressures at which the cuttings travel through the annulus.

Other components of rig equipment vary in wear with air as against fluid drilling. Since all weight in the dry hole is "dead," the strain on equipment related to hoisting is much greater than with fluid; but with increase bit life, trips are drastically reduced. A given well would thus reflect about the same equipment wear whether it be fluid or air. Care must be taken when running casing, however; a dry hole precludes the floating of the string.

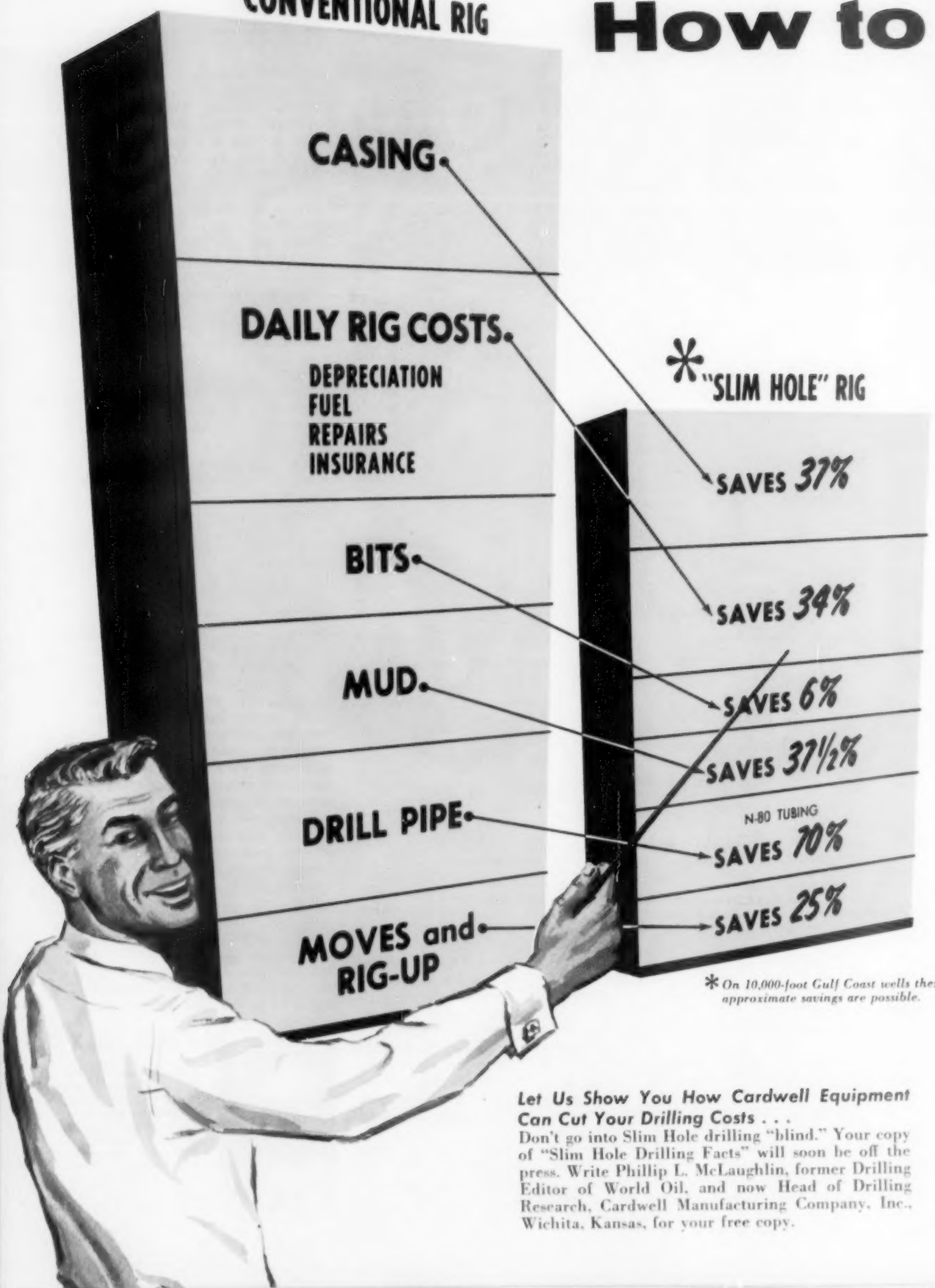
Air holes seem to deviate more than normal. The corrective measures of fewer collars, less bit weight, use of two and four-cone bits, faster rotary revolutions, and other crooked-hole techniques, work as well with air. Frequent tests should be made since deviation can be quite abrupt.

Fishing jobs have been reduced considerably with air, probably due to low internal pressures on the pipe and threads, thus reducing washouts. Those twistoffs which did occur were easily fished since the dry cuttings do not pack like fluid, but blow loose with pressure application. At times higher-pressured gas is injected into the pipe and this loosens and lifts the cuttings; the drill string is free to continue drilling or to be removed by the overshot.

THE AUTHOR

H. J. Magner is district manager for Delta Drilling Co. at Pittsburgh. He is a graduate of University of Texas, acquiring a business administration degree in 1940. Magner has been associated with Delta since 1937.

How to



* *On 10,000-foot Gulf Coast wells these approximate savings are possible.*

Let Us Show You How Cardwell Equipment Can Cut Your Drilling Costs . . .

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cut costs with

SLIM HOLE DRILLING...

One practical approach to reducing exploration and development costs is to drill a smaller than conventional hole using less expensive equipment to effect a reduction in daily operating costs.

Question: **How can Slim Holes lower costs of development wells?**

Answer: FOR THE OPERATOR—here are the big savings.

- **SMALLER CASING...** The trend toward smaller diameter pipe will effect substantial savings over conventional casing sizes.
- **LOWER OPERATING COSTS...** A Slim Hole rig has lower capital investment, depreciation, insurance, taxes, maintenance, and will require much less fuel than a conventional "big" rig. To the operator this reduction of daily operating costs is reflected in logging, completion, round trip, and actual drilling time charges.
- **CHEAPER BITS...** As a result of research, the bearings and tooth structure of today's Slim Hole bits are more efficient than those of a year ago. In some areas the Slim Hole bit performance does not compare with the conventional sizes, but because of their lower cost, savings are still effected.
- **LESS DRILLING MUD...** The volume of mud required for the smaller hole will result in smaller mud bills, smaller mud pits.
- **SMALLER DRILL PIPE...** Because of the "hydraulic picture," it might be practical to use cheaper, small diameter pipe which has a low depreciation. If mud pump pressures are inadequate, the larger diameter, but cheaper tubing grades can be used and will result in less pressure losses.
- **LOW-COST MOVES...** Slim Hole rigs require less rig-up time, fewer loads, and cheaper site preparation.

Question: **What has increased interest in Slim Hole drilling?**

Answer: The fact that high well costs may strangle economic incentive to drill new wells is the major motive.

Oil companies are searching for ways to reduce drilling costs so they may continue to drill the growing number of wells necessary to maintain U. S. producing capacity.

Question: **What part does Slim Hole drilling play?**

Answer: Only one well in nine drilled in search of new oil finds production. Even in development drilling where nearly 50,000 wells are drilled annually, almost 40% are dry holes. In many areas, Slim Hole drilling will mean more wells for the same money.

Question: **What are the deterrents to industry-wide acceptance?**

Answer: Personal attitudes toward anything that deviates from convention is one drawback. However, tools are now available to fish, log, squeeze, cement, perforate, acidize, and install rods, hydraulic pumping or gas lift equipment inside of 2-inch tubing. This promising technique will get a fair chance only if operators are willing to concede some changes. For an example, in some hard formations, the smaller the hole, the greater the crooked hole problem. Today, the *operator* is receiving the most benefits of the Slim Hole technique and can obtain greater cost reductions by accepting a larger angle, a crooked hole, or ascertain some method to drill with lighter weight, either by drilling with a diamond bit, percussion bit, or with air or aerated mud techniques. This will require a thorough understanding of the principles of good drilling practice.

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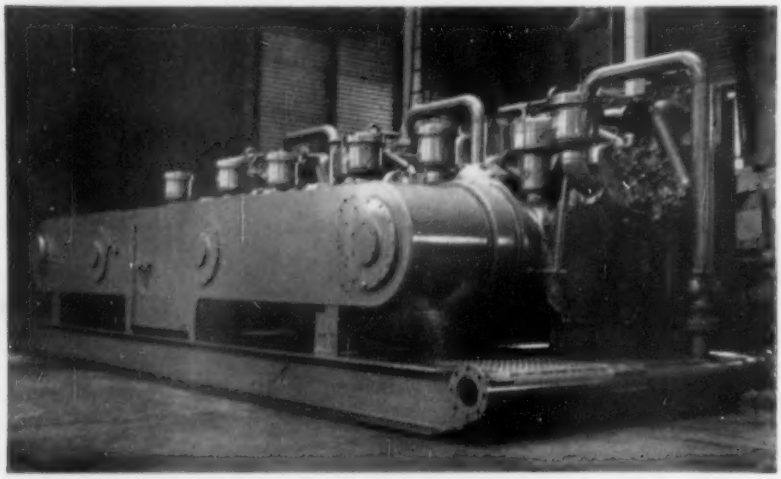

THIS UNITIZED COMPRESSOR assembly was designed to be pulled by the horsepower of the rig which became available in the absence of a mud pump. The unit consists of three 550-cu. ft. compressors with a maximum pressure range to 225 psi. and requires approximately 425 continuous horsepower for operation.

Gas blowouts have been occasioned with no difficulties even though mixed with the input air. Since the annulus is open to the atmosphere through the flare line, confined air-gas conditions are nonexistent, and the explosive hazards are reduced. Too, the high velocities achieved and the dust load being carried seem to reduce the chances of underground explosions.

To emphasize the penetration results of air drilling, the fluid-air comparisons of wells drilled in the same Pennsylvania area are presented in Table 2.

Gas completions . . . This phase of the operation has not received the acclaim that goes with fast drilling, but production men attach great value to this development. They reason that a gas-drilled pay formation eliminates contamination and blockages, and provides the cleanest possible completion.

The Oriskany gas horizon of the Appalachian basin is quite thin. Actual footage drilled averages less than 50 ft., although a few wells to date have drilled 250-ft. section. This provides for a speedy drill-in usually requiring from 12 to 16 hours to drill the pay, strip and lay down the pipe, and close the well in.

Normally, 7-in. casing is cemented by the "water balance" method in the limestone above the gas sand or chert sections. The 3½-in. drill pipe, one 4½-in. o.d. drill collar, two floats, and a 6⅛-in. tungsten bit make up the drilling-in tools inside the casing. Gas volumes of 2 to 4 million cubic feet and pressures of 200 to 800 psi. are used. Wellhead connections above the 7-in. consist of a master gate with 4-in. crosstees, a blowout preventer, and the rotating stripper head preventer. Then 7-in. flare lines with valves are run in two directions from the well; this provides for the extinguishing of the flame and direction change of the gas if necessary. The 4-in. lines are laid from the side gates of the tee as a pressure relief if the blowout preventer has to be closed.

Cement time in the area is usually 72 hours; the equipment assembly above, plus the picking up of the 3½-in. pipe consumes this period of time. The water in the casing is blown out with the gas at intervals dependent on the gas pressure and volume available. Drying of the hole comes next. Gas heaters greatly expedite this problem. Cement is always damp and usually takes the most drying time. However, once dust is achieved, drilling of the remaining lime and pay sand commences. Entry into the gas horizon is immediately reflected in the flare size and volume. Even though the burning gas prohibits open-flow tests, flare-line pressure readings can give acceptable estimates. After drilling the sand, the floats are checked for leaks (none have), and the drill pipe is stripped from the hole and laid down. The last joint, or drill collar, is pulled into the blowout-preventer opening above the master gate; this latter gate is closed and the well shut in.

Completion problems . . . This sounds simple enough but there are a few problems to overcome when the wells produce high volumes. Six recently completed wells in one field ranged from 35 to 150 million cubic feet per day. Flare-line pressure readings ranged from 40 to 200 psi. Drill-pipe buoyancy or weight loss as reflected on the line indicator ranged from a negligible amount to 46,000 lb. Snubbing of the pipe became necessary and improved techniques resulted. The key pieces of snubbing equipment are the bottom hold-down slips with straight or reverse dogs, and the top or traveling hold-down clamp sub which goes up with a restraining winch line. However, hydraulic hold-down assemblies should be considered, especially with large wells in prospect. If the pipe gets loose, presently used snub cables may not be sufficient. Slippage of the pipe is prevalent due to ice formed by high volumes; alcohol is quite effective as a removal agent, allowing the slips to grip properly.

Although generally used on gas completions, this open-type technique should have many applications in the drilling in of oil wells. So long as low flare-line surface pressures can be achieved and the pipe safely stripped or snubbed out, this type completion has the possibility of being effective in solving many completion difficulties.

THIS "DUST" PILE is an accumulation of cuttings blown from a hole 5,000 ft. in depth. It is approximately 10 ft. high and 20 ft. in diameter.

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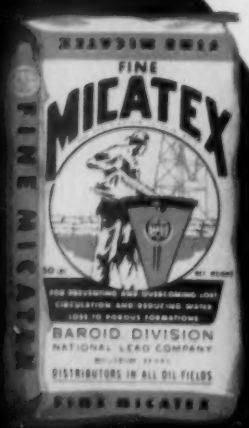

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How They're Drilling With Gas in Colorado And Wyoming

Penetration rates and bit footage better than those of usual method

by S. J. Fisher
Mountain Fuel Supply Co.

AIR DRILLING has made Mesaverde sands at Canyon Creek and Sugar Loaf fields economic. Fig. 1.

GAS drilling has permitted Mountain Fuel Supply Co. to complete wells in Sugar Loaf and Canyon Creek fields in a more economical and efficient manner than previously experienced by using commonly practiced drilling and completion methods with drilling mud.

Rates of penetration and bit footage while drilling with gas exceeded those obtained while drilling with mud. The main limitation of gas drilling as indicated by experience in Colorado and Wyoming is imposed by fluid-bearing formations. We believe that gas drilling will have a favorable future and that it will occupy a prominent place in the drilling industry in the years ahead.

Gas-drilling operations of Mountain Fuel Supply Co. for the present are concentrated in Sugar Loaf field, Moffat County, Colorado, about 53 miles southeast of Rock Springs, Wyo., and Canyon Creek field, in Sweetwater County, Wyoming, about 8 miles north of Sugar Loaf field (Fig. 1).

Sugar Loaf Field

Initial test . . . In May 1953, Mountain Fuel Supply Co. spudded Government Well No. 1, a wildcat test to evaluate the Mesaverde formation (Cretaceous age); in this area the Mesaverde is topped at about 4,800 ft., is roughly 2,700 ft. thick, and consists of alternating sands and shales. This well was drilled by conventional rotary methods with mud to a total depth of 7,658 ft. A Mesaverde sand from 5,146 to 5,186 ft. was drill-stem tested in open hole and yielded 4,580 M.c.f. of dry gas a day; bottom-hole flowing pressure was 395 psig. and bottom-hole shut-in pressure was 1,980 psig. At the time of the drill-stem test, the drilling mud had a water loss of 8 cc.

After reaching total depth, the well was plugged back to 5,770 ft., and 5½-in. o.d. casing was run and landed at 5,458 ft. The zone from 5,145 to 5,190 ft. was perforated with bullets and drill-stem tested. No gas reached the surface during this test, although when tested in open hole, this sand produced gas at the rate of 4,580 M.c.f. a day. The above zone was perforated with four holes per foot using jet charges; on a drill-stem test it produced 15 M.c.f. of gas a day. The sand then was treated with 500 gal. of mud cleanout agent, after which the well produced gas at the rate of 486 M.c.f. a day. This increase in gas production was encouraging enough to retreat the interval with 1,000 gal. of mud cement agent which was swabbed from the well. After the second treatment, gas production declined slightly to 439 M.c.f. a day.

The final step in the completion of the well was the application of fracture treatment, after which the well produced gas at the rate of 2,830 M.c.f. a day.

From the above case history, it is evident that the **commonly practiced**

TABLE 1—RATE OF PENETRATION AND BIT FOOTAGE, MESAVERDE FORMATION, SUGAR LOAF FIELD

Well—	Drilled with	Hole size in.	Footage drilled	Bits used	Average rate of penetration ft. per hr.	Average bit footage ft. per bit
2 Government	Mud	9	227	4	4.35	56.75
	Gas	6	415	2	31.30	207.50
3 Government	Mud	9	156	2	5.25	78.00
	Gas	6⅛	430	1	12.90	430.00
4 Government	Mud	9	302	3	4.50	100.68
	Gas	6⅛	282	1	23.40	282.00
1 State Land	Mud	9	363	5	3.81	72.60
	Gas	6	480	2	17.80	240.00

TABLE 3—RATE OF PENETRATION AND BIT FOOTAGE, MESAVERDE FORMATION, CANYON CREEK FIELD

Well—	Drilled with	Hole size in.	Footage drilled	Bits used	Average rate of penetration ft. per hr.	Average bit footage ft. per bit
3 Unit	Mud	7⅞	665	10	3.53	66.50
	Gas	5⅞	1,026	12	6.44	85.50
4 Unit	Mud	9	891	11	5.30	81.00
	Gas	6⅛	141	2	7.14	70.50
5 Unit	Mud	9	944	12	4.57	78.60
	Gas	5⅞	182	2	6.39	91.00
6 Unit	Mud	9	856	12	6.00	71.40
	Gas	6⅛	182	2	6.75	91.00
7 Unit	Mud	9	769	10	4.65	76.90
	Gas	6¾	1,195	15	5.77	79.70

TABLE 2—DIAMOND CORING DATA, USING AIR

1. Footage cored	84
2. Average coring time, min. per ft.	3.8
3. Average gas volume used, M.c.f.d.,	2,000
4. Average gas pressure, psig.	275
5. Average weight on core head, lb.	8,000
6. Average r.p.m.	50
7. Size of core hole, in.	6
8. Size of core barrel, in.	4¾
9. Diameter of core, in.	2⅝
10. Per cent recovery	80
11. Length of core barrel, ft.	30

drilling and completion methods are not adequate for this area and other areas as far as the Mesaverde formation is concerned.

To date, Mountain Fuel Supply has drilled, in addition to the discovery well, six wells in Sugar Loaf field, four of which are productive; each of the last six wells was drilled in with natural gas.

Drilling practice . . . In general, about 100 ft. of 10¾-in.-o.d. surface pipe is run and cemented. Nine-inch hole is drilled, by conventional rotary methods with mud, to about 5,060 ft. which is roughly 260 ft. in the Mesaverde formation. Seven-inch o.d. casing is run and landed on bottom; clear water is used to displace the cement. Water is displaced from the casing with gas, and 6¼-in. hole is drilled with gas to the Mesaverde producing sands which may occur anywhere from immediately below the casing point to a depth of 400 ft. below the casing point.

Evaluation of Gas Drilling in Sugar Loaf Field

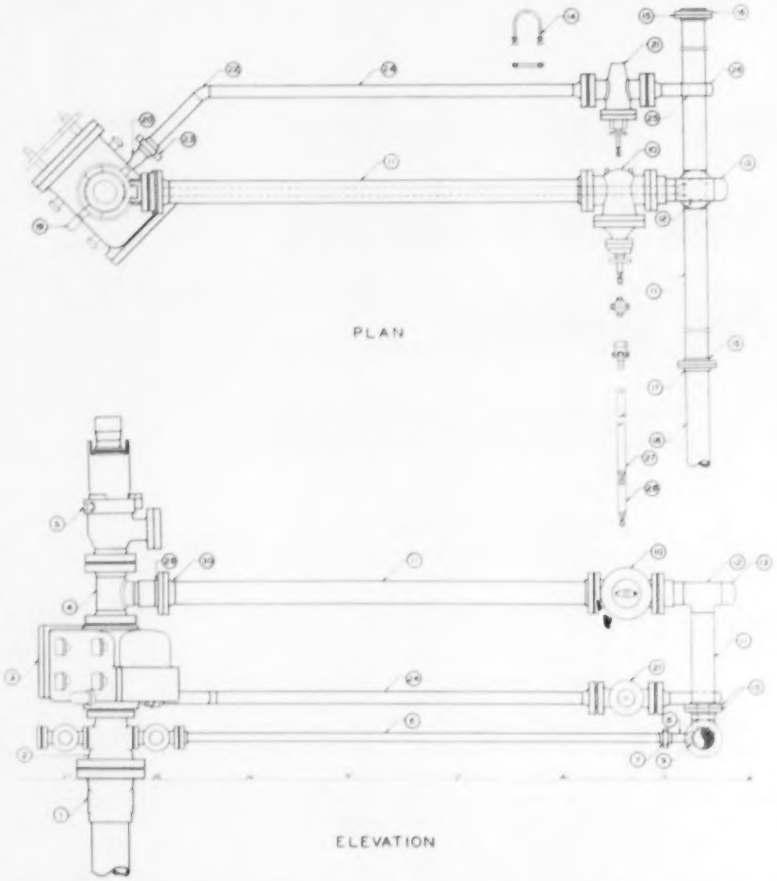
Table 1 shows the comparison of rates of penetration and bit footage for wells drilled in with gas as compared to rates realized while drilling with mud in the same well. All data tabulated pertain to the Mesaverde formation.

Using the conventional diamond core barrel and core head, one well in Sugar Loaf field has been cored with gas. Table 2 gives the data for this well.

The maximum open-flow potential for wells drilled in with gas in Sugar Loaf field is 7,130 M.c.f. a day; average shut-in surface pressure is 1,870 psig.

Canyon Creek Field

Gas-drilling equipment, drilling-in, and completion procedures as practiced in Canyon Creek field are identical to those used in Sugar Loaf field. To date, five wells have been drilled in with gas in this field. The Mesaverde formation is penetrated an average of 825 ft., using conventional drilling methods with mud; 7-in. casing is landed



UNDERFLOOR HOOKUP and manifold used for drilling with natural gas. See Table 4 for description of numbered pieces of equipment. Fig. 2.

Table 4—Material List Applicable to Plan and Elevation Views Above

1. Casing-head housing flanged 10 in. Series 600.
2. Tubing-head spool. Bottom flanged 10 in. Series 600; top flanged 6 in. Series 600.
3. 7-in. double gate preventer; bore 7⅛ in.
4. Shop-made steel tee flanged top and bottom 6 in. Series 900. Bore through tee 7⅛ in., side outlet threaded 6⅝ in., 8-round thread, short casing thread, outlet bore 5 in.
5. Rotating blowout preventer with 6 in. Series 900 flange down. Bore 7⅛ in. and 4 in. Series 900 flanged outlet.
6. 2-in. x 12-ft. E.S. pipe.
7. 2-in. 2,000-psi. wing nut unions.
8. 2 x 6-in. E.S. nipple.
9. 2 x 6-in. threaded Weldolet.
10. 6-in. gate valve.
11. 6-in. x 21-ft. E.S. pipe.
12. 6 x 6 x 6-in. E.S. welding tee.
13. 6-in. E.S. welding cap.
14. 2 shop-made U-bolts.
15. 6-in. 150-psi. R.F. slip-on flanges.
16. 6-in. 150-psi. blind flange.
17. 6-in. 150-psi. R.F. companion flange threaded for 6-in. line pipe.
18. 6-in. x 300-ft. T. & C. line pipe.
19. 3-in. E.S. Bull plug.
20. 3 x 2-in. E.S. swage nipple.
21. 3-in. 3,000-psi. w.p. gate valve flanged 3-in. Series 900.
22. 3-in. 45° E.S. welding ell.
23. 3-in. 2,000-psi. wing nut union.
24. 3-in. x 13-ft. E.S. pipe.
25. 3-in. E.S. welding tee.
26. 3-in. E.S. welding cap.
27. Shop-made universal joint to fit 6-in. gate valve stem and 2-in. pipe complete with approximately 30 ft. of 2-in. pipe with male square stub end and valve wheel.
28. Shop-made universal joint to fit 3-in. 3,000-psi. flanged gate valve stem and 2-in. pipe complete with approximately 34 ft. of 2-in. pipe with male square stub end and valve wheel.
29. 6-in. 300-psi. R.F. WN flange. Shop remodeled with 6⅝-in., 8-round thread, short casing coupling welded.
30. 6-in. 300-psi. R.F. WN flange.

A PITOT TUBE (small curved pipe) is placed at the end of the flare line to measure formation gas. Fig. 3.

ed at approximately 5,500 ft., and the well is drilled in with gas. A minimum of 141 ft. and a maximum of 1,195 ft. of hole have been drilled with gas below the casing point.

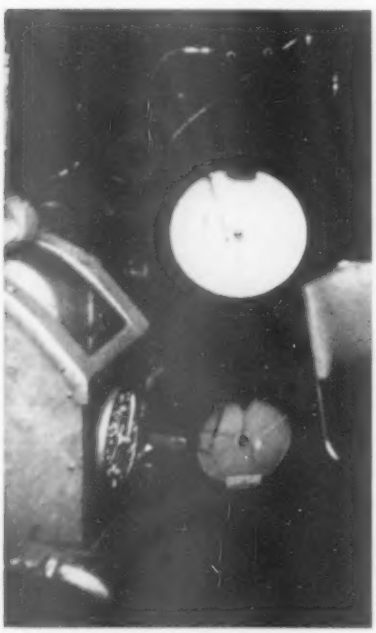
Table 3 shows the comparison of rates of penetration and bit footage for wells drilled in with gas, as compared to rates realized while drilling with mud in the same well.

A comparison of Tables 1 and 3 indicates that for gas drilling, the average rate of penetration is much higher and the average bit footage is better in Sugar Loaf field than in nearby Canyon Creek field. The difference is a result, in part, of the presence of an appreciable amount of natural-gas liquids in the Mesaverde formation at Canyon Creek field. In addition, the Mesaverde in Canyon Creek field appears to be harder than in Sugar Loaf.

The maximum open-flow potential for wells drilled in with gas in Canyon Creek field is 14,000 M.c.f. of gas per day; average shut-in surface pressure is 2,050 psig.

Advantages and Disadvantages

The increased rate of penetration obtained with gas drilling is generally attributed to:



FLOW METER and temperature recorder are placed on the rig floor. Fig. 4.

CHAIN SLING attached to assembly aids in removing and installing units. Fig. 5.

THE AUTHOR

S. J. Fisher is senior petroleum engineer for Mountain Fuel Supply Co., with headquarters in Rock Springs, Wyo. He joined Mountain Fuel in 1948 after receiving his degree in petroleum engineering from Colorado School of Mines. Fisher is a native of Denver.

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1. Cleaner hole bottom, because of extremely high velocity around the bit.
2. Absence of mud cake.

Another important characteristic of gas drilling observed is increased bit life. Bit-life improvement is a result of one or more of the following factors.

1. The cooling effect of expanding gas.
2. The cooling capacity of the large volumes and highly turbulent velocities of gas.
3. The rapid removal of cuttings.

In addition to greater drilling speeds and bit life, gas drilling has the following advantages when compared to drilling with mud:

1. Less susceptibility to loss of circulation.
2. Less possibility of injuring the producing zone by drilling fluid and particle penetration.
3. Less possibility of overlooking productive intervals.
4. Less possibility of contaminating cores and cutting samples.

The following apparent disadvantages also exist:

1. Less primary control of well pressure.
2. Less support for sloughing formations.
3. The hazard of fire while drilling and logging.

Hazards of Drilling With Gas

Water is the great enemy of the Mesaverde formation and of gas drilling. In addition, natural-gas liquids are also a hazard in that they cause formations to slough, and increase the danger of sticking the drill pipe. Wet cuttings also will form wall cake on the inside of the casing, making it difficult to make a trip. If the volume of fluid entering the well bore is small, it is possible to drill by the wet spots by increasing the pressure and volume of

drilling gas. If the volume of fluid entering the well bore is excessive, it might be necessary to set a liner through the moisture or return to drilling with mud.

Fire is another hazard encountered in gas drilling. Motor exhausts should be dampened with water, and whenever a connection is made, or gas is released at the rig, a check should be made to insure that water is going into the exhausts. Drilling-head stripper rubbers should be changed often to eliminate the possibility of fire caused by gas leaking on the rig floor through worn rubbers. Periodic safety instructions for rig personnel is of utmost importance.

Here's how Mountain Fuel & Supply Co. drills in and completes Mesaverde gas wells.

Gas-Drilling Equipment

Fig. 2 shows a plan and elevation view of the underfloor hookup and manifold used for drilling with natural gas. Table 4 presents a material list applicable to Fig. 2.

In regard to underfloor equipment, our practice is to install the tubing-head spool on the casing-head housing after the production string is landed. Next a double-gate preventer is installed. The lower rams, of course, are the blank rams, thereby allowing the upper drill-pipe rams to be changed for repairs or the size of the rams to be changed to accommodate different size drill pipe or tubing.

Above the preventer we have installed a shop-made steel tee; the flow line is attached to the bull-headed side and allows returns to flow into the flare line, where the gas is burned and dust is blown to atmosphere. A valve between the tee and flare line is a "must" but it does not necessarily have to be capable of withstanding full well pressure so long as the tee is located above the preventer.

A packoff drilling head is attached to the underfloor hookup as a top piece. For this purpose we are using a rotating blowout preventer. This unit packs off around the kelly and has a driving unit attached to the kelly that rotates the packoff unit with the kelly; thus the only movement of the kelly through the packoff rubber is a vertical movement. This rotating assembly latches into the body of the rotating preventer, and it can be removed at any time by unlatching the catch and pulling it out of the body with the cat line. It can then be stripped off the drill pipe to replace a rubber or to repair the unit.

Lubricating drill pipe . . . A few gallons of lubricating oil poured into the rotating assembly above the stripper rubber will lubricate the drill pipe as it slides through the rubber going in the hole. If the rubber is in good shape, hardly any of the oil will be used, as the rubber will wipe the pipe clean. Most of the wear on the stripper rubber occurs when hoisting the drill pipe.

The pipe is dry and dust coated, and there is no way to lubricate before it passes through the rubber.

Flare line . . . The two openings in the tubing-head spool should be piped into the flare line. The regular wing valves on the tubing head are used to control these lines. The fill up line opening in the preventer should have a valve installed that is capable of withstanding full well pressure; and it should also be tied into the flare line.

A kill line tied into the tubing-head spool and arranged so that mud can be pumped into the well in case of trouble is also desirable. All underfloor valves that will require operation during an emergency should have extensions attached. Extensions on manually operated preventers should also be positioned so they can be operated under any conditions.

The flare line used for gas drilling should be of large diameter to minimize the abrasive action of cuttings carried by the gas. We have been using approximately 300 ft. of 6-in. line. A pilot light is kept burning constantly at the end of the flare line. About 100 ft. from the end of the flare line a baffle and a 2-in. valve are installed in the flare line to check for formation cuttings or liquid.

Measuring flow . . . The flow of gas at the end of the flare line is measured with a pitot-tube arrangement that consists of 20 to 30 ft. of ¼-in. pipe fastened to the top of the last joint of the flare line. The end of the ¼-in. pipe has a 180° bend at the flare line opening, and the pipe can be rotated in and out of the gas stream. The impact pressure is read by use of a manometer. Fig. 3 represents the end of the flare line showing the pitot-tube arrangement used to measure formation gas. The photograph was taken while displacing water in the casing with gas.

It is extremely important that the end of the flare line be located in such a manner that the driller can observe the flare from his position at the brake. In addition, it is recommended that a gas orifice flow meter be installed on the rig floor, near the brake, so that the driller can observe the volume of drilling gas being used as well as the drilling gas pressure. Fig. 4 shows flow meter and temperature recorder installed on the rig floor within clear view of driller while at the brake. The meter run is located in rig substructure.

Wear and tear . . . The passage of gas

DRILLING-IN AND COMPLETION PROCEDURE

1. Run and cement 7-in. o.d., 23-lb. casing. Bottom three joints of casing and floating equipment should be spot welded. Displace cement with clear water.

2. Land casing, as close to bottom as possible, immediately after cementing. Install tubing head, and test slip and seal assembly to 2,000 psi. for 5 minutes. Install gas-drilling equipment.

3. Close blind rams and pressure test casing and preventer to 2,000 psi. for 1 hour.

4. Go in hole with 6¼-in. bit, drill collars, and 3½-in. external flush drill pipe, and displace water in casing with gas to top of float collar. After casing is dried, drill float collar, cement in shoe joint, and shoe. Drill ahead for approximately 400 ft. until potential producing Mesaverde sands are penetrated. Gage formation-gas production while making connections.

5. Run gamma-ray, induction, and temperature log from the casing point to total depth.

6. Lay down drill pipe, change upper rams in double-gate preventer, and stripper rubber in rotating head. Run 2⅜-in.-o.d. tubing with bottom of perforated joint bull-nosed with 1-in. opening. Lower 5 ft. of bottom joint to be perforated with forty ⅜-in. holes. Land tubing so that bottom is as close as measurements will permit to bottom of casing. Run a cast-iron tubing disk in the collar of the perforated joint.

7. Remove gas-drilling equipment and install remainder of wellhead. Drop bar and rupture tubing disk; shut master valve, close casing outlets on tree. Shut well in for pressure buildup.

through a rotary hose appears to cause the hose to deteriorate by loosening the layers of rubber on the inside, thus causing them to flake off and result in the ultimate failure of the hose. A 2-in. single-wire braid hose, 50 ft. long, has been substituted very satisfactorily for the rotary hose.

We have been using 3½-in. external flush drill pipe and find that it is ideal for gas-drilling purposes. A drill-pipe float valve is run directly above the bit to prevent gas from flowing up through the drill pipe and escaping on the floor when a connection or trip is made.

A hard abrasive formation rock bit with the water courses drilled out appears to do a very good job of making hole while drilling with gas. Experiments have indicated that some special-purpose bits may prove to be satisfactory.

Drilling gas . . . For our initial gas-drilling operations in Sugar Loaf field, drilling gas was obtained from Mountain Fuel Supply Co.'s main gas-transmission line (Fig. 1). This gas was ideal as it had been dehydrated, chilled, and was free of liquids. Later, gas was obtained from newly completed wells in the field. Average gas volume used for drilling was 2,000 M.c.f. a day at an average standpipe pressure of 275 psig.

Gas drilling begins after the underfloor equipment is installed and the casing and preventer are tested. The following procedure is suggested: Pick up the drilling string, starting with a bit, float valve, collars, and drill pipe. Go in the hole to a depth no greater than that at which the available gas pressure and volume will blow the water from the casing; in our operations this depth is five stands.

Install the rotating assembly on the last single picked up and place it in the body of the rotating preventer. A pointed mandrel that will screw on the pin end of a joint of drill pipe facilitates slipping and rotating assembly on to the drill pipe. Greasing the mandrel and drill pipe is also helpful. Pick up the kelly and attach the driving unit to the kelly below the bushing. Screw the kelly into drill stem, and turn gas into drill pipe in order to blow the hole clean.

After the hole is blown free of initial water returns, run an additional five stands of drill pipe and repeat the above procedure. Do not attempt to completely dry up the hole at this time, but wait until reaching bottom, and at that time blow gas through the drill stem until returns are absolutely dry. When gas returns are dry, start drilling in the conventional manner; be sure that the driving element is engaged properly. In our operations average weight on bit while gas drilling amounts to 10,000 lb., average rotary table speed was 70 r.p.m. Light the flare-line pilot after water returns decrease to the point that the gas will ignite.

The floating equipment will drill slowly. After drilling the shoe, check the flare to determine whether moisture is encountered under the shoe. If moisture is present under the shoe, do not drill ahead until the hole is dry.

After drilling a kelly down, circulate gas until the flare stops dusting, indicating that the hole is clean. Pick up the kelly with circulating gas still flowing into the drill stem. When the kelly is in position for connection, shut off drilling gas and release gas from the drill stem through a valve on the rig floor. The gas so released is vented into the flare line. After releasing pressure from the drill stem, make a connection in the conventional manner. Turn circulating gas into drill stem and check flow meter to be sure that gas is actually flowing through the bit before setting down on bottom to drill ahead. Check driving element before rotating drill pipe.

After formation gas is encountered, it should be gaged, with the drilling gas off, while making each connection.

Making trips . . . Hoisting the drill stem is done in the conventional manner, and when the bit is almost out the bottom collar should be measured out to a point where the bit is just above the blank rams. Close the blank rams making sure the valves below the rams are open, so as to permit the formation gas to flow out of the flare line. After closing the blank rams, close the valve between the tee and the flare line and remove the rotating assembly. The rotating assembly is held above the bit on the drill collar while changing the bit and checking the float valve. A chain sling attached to the ears on the rotating assembly adds to the convenience of removing and installing the units (Fig. 5). After changing the bit and checking the float and rotating assembly, reverse the above procedure and run the drill stem back into the hole.

Bridges . . . If a bridge is encountered while going in the hole, install and lock the rotating assembly in place prior to drilling the bridge. Usually a large volume of formation gas at reservoir pressure is packed under these bridges. Caution should be exercised in drilling them out. Tight spots in the casing have been dried up by blowing drilling gas through the drill stem. The dried wall cake will then be dust and be blown from the hole. Drill pipe stuck in the casing has been loosened by spotting a small amount of water or oil in the annulus.

While running the gamma ray, induction, and temperature logs in the open hole below the casing point, full formation gas volume flows unrestricted through the rotary table.

In our operations, liners are not required to prevent the open hole below the casing point from sloughing.

Completing the well . . . After laying down the drill pipe, the upper preventer rams and the packoff rubber in the rotating preventer are changed to accommodate 2⅜-in.-o.d. tubing. The perforated joint is picked up, and a cast-iron tubing disk is screwed in the collar. This disk prevents gas from flowing up through the tubing while going in the hole. The tubing is run in the hole and before the tubing hanger is installed, the rotating assembly must be removed. The pipe rams are closed, with the tubing head wing valves and the 3-in. valve below the rams open, while the rotating assembly is removed. The rams are then opened, and the tubing hanger is lowered into position.

After hanger is seated in the tubing head spool, the thrust nuts in the top flange are tightened, and the handling joint is unscrewed and laid down. The tubing wing valves must be wide open after landing the tubing, in order to vent the formation gas into the flare line. The underfloor equipment is removed, and the remainder of the wellhead above the tubing head spool is installed; a steel bar is dropped from the surface, rupturing the tubing disk and equalizing the pressure in the tubing and casing. The well is completed.

Acknowledgement

Appreciation is expressed to the management of Mountain Fuel Supply Co. for permission to assemble the data necessary for the preparation of this paper.

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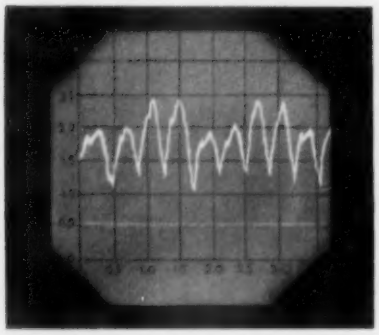
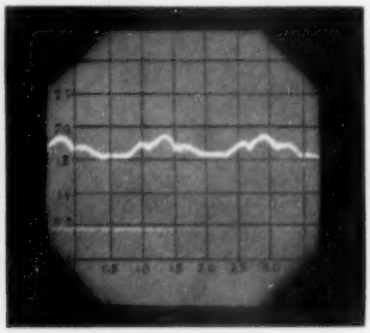


BEFORE . . . Oscilloscope photo shows how severe mud pump vibration can be.



AFTER . . . Pulse damper can reduce vibrations by 75 per cent during field operations.

Stop that costly

MUD-PUMP VIBRATION

Here's a new device that "soaks up" pump pulsations and thereby prevents vibration and shock to the drilling rig

by Walter Stampfl

ALL too frequently, drill-rig down time and maintenance can be traced to the mud pump. The powerful pulsations set up by the mud pump induce severe shock and vibration in the pump itself and in the rotary hose; swivel couplings, and other vital components. Line surges can develop pressure peaks beyond the rated burst pressure of pipes and fittings. As a result, time, money, and labor must be expended in tearing down equipment and repairing and replacing damaged parts.

There is little that anybody, be he drill-rig superintendent, tool pusher, or pump designer, can do to avoid the pressure pulsations set up by the pump. Pumps by their very nature deliver pulsating flow, the degree of pulsation varying with the type of pump. The higher the pressure, the greater is the effect of the pulsations—and it is the piston-type pump such as the reciprocating mud pump that is best suited for high-pressure operation.

However, there is a relatively new simple, compact, and highly efficient device that will "soak up" the pump pulsations and thereby prevent vibration and shock damage to the drill rig. The device is the bag-type hydropneumatic accumulator or pulse damper.

Application of some form of accumulator (there are at least eight basic varieties) to absorb line surges is an old and familiar practice in the oil field as it is in industry generally. The surge tank, air bottle, or air bell on top of the discharge port of duplex and triplex pumps are classed as "pneumatic nonseparator" accumulators. "Pneumatic" because air or nitrogen acts as the surge damper; "nonseparator" because the gas and the line fluid are in direct contact.

While a high-pressure nonseparator type of accumulator is still used to some extent on mud pumps, this type has many undesirable features. One great disadvantage is that aeration, or mixture of fluid and gas, results in loss of precharge in the same manner as with an air bell, which nullifies the usefulness of unit as a pulse damper. Further, the unit is only good for about 6 hours of operation before it loses precharge pressure and fills with line fluid. Pumping must be stopped frequently to recharge the unit—a back-breaking job and a time-consuming one.

Because of these limitations, the great majority of accumulators used for mud pumps are of the flexible separator type. In this category, some form of flexible wall is provided to isolate the gas compartment from the fluid compartment. A variety of "walls" are used, including diaphragms, mechanical bellows, rubber sleeves, etc. While these accumulator designs have proved successful in smoothing out line surges, they have not been altogether satisfactory from an operational and maintenance point of view. This is pointed up by the fact that probably no more than 20 per cent of drill rig mud pumps are equipped with accumulators—although the desirability of using such a device is almost universally recognized.

Some of the objections to designs heretofore available include: excessive weight, requiring the use of a chain hoist and a crew to handle an accumulator; excessive time to assemble and disassemble; excessive wear in the separator due to flexure fatigue around the edges where the separator is fastened in place, and a limited drilling-pressure range in which the accumulator can perform efficiently. No one type has all of these faults, but each has enough of them to make the accumulator somewhat troublesome for the tool pusher's crew.

Most, if not all, of these difficulties have been avoided or minimized in a newly designed accumulator, utilizing a bag-type separator. Reports from installations in the field indicate that it adequately meets field requirements for simple operation, safety, and dependability, operational efficiency, and ease of installation and maintenance.

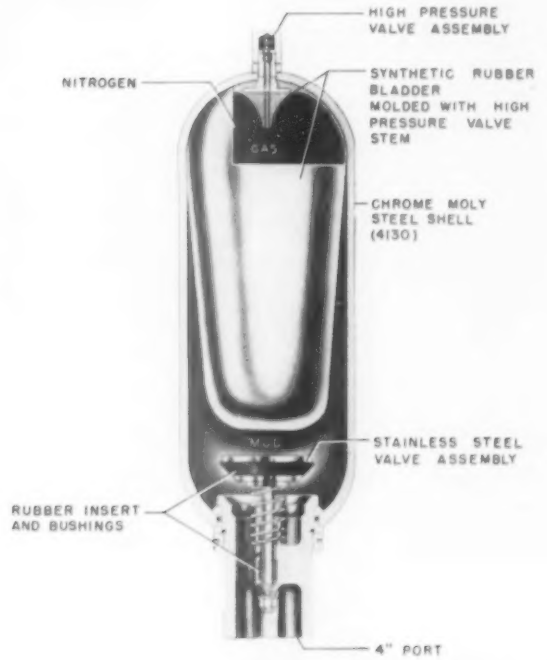
Bag-Type Pulse Damper

The bag-design pulse damper is a mechanism in which potential energy is stored in a totally enclosed gas chamber with flexible walls contained within a fluid chamber with rigid walls.

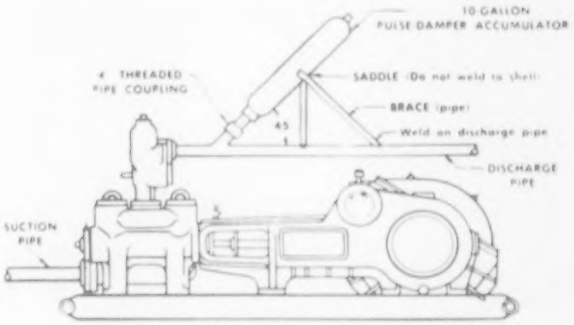
The complete assembly consists of a steel-alloy shell, a synthetic compound separator bag incorporating an integrally molded high-pressure air valve, and an oil port assembly. The shell is made from a single piece of S.A.E. 4130 alloy steel without seams, welds, or joints. Ends are spun to form the air and discharge port ends. The shell is designed so that the mouth will spread at a point below the designed burst pressure, extruding a ring seal and causing immediate pressure loss. The unit is designed for a maximum working pressure of 3,000 psi.

The pear-shaped separator bag is drawn into the shell through a 4-in.-wide discharge port at the bottom. It is secured in place by a jam nut screwed on the air-valve stem which fits into a hold in the upper end of the shell. The integrally molded high-pressure air valve with a removable core permits

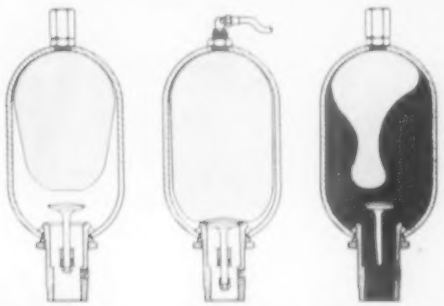
The author is design engineer, Greer Hydraulics, Inc.



CUTAWAY VIEW of the pulse damper. The bag-type operates on the principle of Boyle's law; that is, if the pressure is doubled, the volume of inert gas is halved.



TYPICAL INSTALLATION ON SLUSH PUMP



How the accumulator reduces pump vibration.

preloading the bag from an external supply—a nitrogen cylinder is recommended.

The discharge plug is installed in the 4-in.-diameter port at the lower end of the shell. The width of the port is such that it connects easily with the discharge pipe of the mud pump. A high-pressure synthetic-rubber O-ring effectively seals the chamber against leakage. The plug is designed to provide a maximum flow area for unrestricted flow of mud. A stainless-steel spring-loaded poppet assembly fitted with a rubber "biscuit" or insert, and riding on rubber bushings, is used to maintain high efficiency. The rubber components and the stainless steel provide the necessary protection against the abrasive action of the mud slurry. Old installations indicated that ordinary forged steel without the rubber inserts and bushings were scored too badly by the mud. The discharge plug lock nut or retaining nut has a hammer fitting for ease in assembly and disassembly in the field.

Pulse-Damper Operation

A flexible separator-type accumulator operates on the basis of Boyle's law for gases, which states that the product of the pressure and volume for a given gas at a given temperature is a constant. In other words, if the pressure is doubled, the volume is halved. In the bag-type pulse damper, the bag is first preloaded with air or nitrogen to a predetermined pressure. Preloaded, the bag is inflated to its full 10-gal. capacity, and the poppet valve in the discharge port is closed.

The first drop of mud slurry which enters the pulse damper must displace an equal volume of gas in the bag; therefore, it must enter at the preload pressure. As more slurry is pumped into the shell by line surges, the air is further compressed in such a way that the air pressure is always equal to the mud slurry pressure, and the bag floats in equilibrium.

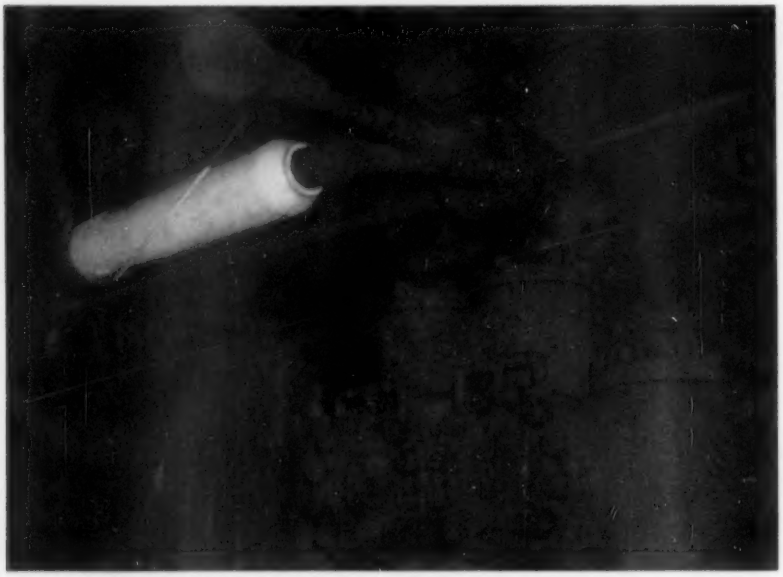
Closer examination of the bag-type pulse damper will show why it is able to avoid the difficulties encountered with previous accumulator designs.

The bag-separator expansion follows the Barlow formula for hoop stress which states that "the stress in a circle is directly proportional to its diameter and wall thickness." As a result, when the bag expands, it stretches around the top at its greatest diameter and thinnest wall, and gradually stretches downward to push the bag outward against the shell side walls, thus squeezing out every bit of slurry in the accumulator. It is for this reason the bag-type pulse damper has such high volumetric efficiency. Literally the total volume of the accumulator shell is available for use in shock absorption. Older designs were unable to utilize the full volume of the casing.

In some cases the usable volume was reduced by the space occupied by the separator framework. In other cases, the separator could expand to only a limited degree. The bag-type pulse damper can be given a precharge as high as 1,000 lb., roughly twice as high as many previous accumulators can be precharged. When inflated without stretching, the bag volume is one-half the total volume. Yet it has been found practical to compress the air in the bag to a ratio as high as 5 to 1.

Precharge Range Important

Regardless of the type of accumulator involved, surge tank or bag-separator pulse damper, the effectiveness of surge absorption depends upon maintenance of the proper precharge for the gas. A line surge is dampened by slowing down the speed of the surging liquid by making it compress the gas. To take an extreme case, suppose the initial pressure in the gas compartment is equal to the drilling pressure. The accumulator would not function well for two reasons: (1) it would act as



PULSE DAMPER (highlighted) mounted on an offshore rig. The unit weighs only 185 lb. and can be installed by two men.

THE ACCUMULATOR or pulse damper shown in the top photo is installed on this barge drilling in Breton Sound, off the Louisiana Gulf Coast.

a very stiff spring, since the gas is already highly compressed; (2) additional compression may exceed the safe working pressure for the device.

What is more likely, the precharge pressure may be low as compared to the drilling pressure. This may be due simply to a loss in pressure or an inability to withstand a higher pressure because of a low maximum working pressure. The net effect is that of a sluggish unit—a "soft" spring as it were. This becomes readily apparent in the whip of the kelly hose.

It is taken for granted that the accumulator has sufficient capacity, that is, enough volume in the air compartment so that the surge can have enough room to slow down, like having enough distance for the brakes to bring the car to a stop before a collision. For without this capacity, the accumulator will not do a job regardless of the precharge. Indeed, it is this lack of volumetric capacity that has given rise to the unsatisfactory operation of accumulators in the past. The nonseparator accumulator is an outstanding example of a type with low volumetric efficiency.

In the case of the bag-separator pulse damper, it is recommended that the precharge be between 40 and 80 per cent of pumping pressure. Suppose the drill is operating at 1,000 psi. If the bag was precharged to 80 per cent or 800 psi., and the pump pressure should go up to 2,000 psi. for deep jet drilling, the precharge pressure would be 40 per cent of drilling pressure. The pulse damper would still have sufficient bag volume to absorb surges. If the drill rig is to do shallow and deep drilling, it is important that the precharge be high enough so that the pulse damper will have sufficient capacity both at the low and the high-pressure level. Some accumulator types cannot take a high percharge.

The reasons for the long life of the bag separator can be appreciated by considering how it is mounted in the shell and its mode of operation. Instead of being fastened in place around a circumference, as is the case with older separators, the bag is fastened only at the top. While the circumference would be a point of stress as the separator repeatedly expands and contracts during surges, the point of fastening for the bag is not a point of stress concentration.

Further, the bag is, in a sense, a "free form" in that as a surge of mud slurry semicollapses the bag, the bag shape is always a little different so that the folds do not occur along the same lines. This avoids wear-cracking the bag. A separator that has anchor points will tend to stress and fail at those points.

Installation

The 10-gal. bag-type pulse damper can be installed easily and inexpensively with standard fittings. Since it weighs only 185 lb., two men can lift it into position and secure the unit to the mud-pump circuit. It is important to install the unit as close to the pump discharge port as possible—and at a 45° angle to the pump discharge pipe. The closer to the pump discharge port, the less distance a line surge will travel before it is dampened. The 45° angle prevents mud slurry from settling in the shell and will permit the poppet valve to operate most effectively.

It is important to check the precharge if the accumulator is acting sluggish. This can be done only when the pump is not pumping, i.e., during a trip. It may be that the bag was precharged too low. Also the air valve stem should be checked for gas leaks.

Coleville's oil is a heavy gravity—13.7°

Coleville contractors skid their rigs.

They Learned Quickly, and Well, at Coleville

Now they're studying means of increasing the field's ultimate recovery

by D. D. Wright
Royalite Oil Co., Ltd.

COMPLETION of the development phase of exploitation of Coleville pool, Saskatchewan, has proved that economical operation of heavy-crude fields is possible. This has been effected by using variations of conventional oilfield techniques. It has also shown that a market can be found for low-gravity crudes whenever and wherever it is found. There now remains the problem of costs of operation, emulsion treating, and water disposal; and Royalite Oil Co., Ltd., plans a study of methods which may be applied to increase ultimate recovery from the pool.

Coleville Banff sand pool is located 115 miles south-southeast of Lloydminster field and 100 miles north-northwest of production in the Swift Current area, approximately 30 miles east of the Alberta border. (See map.)

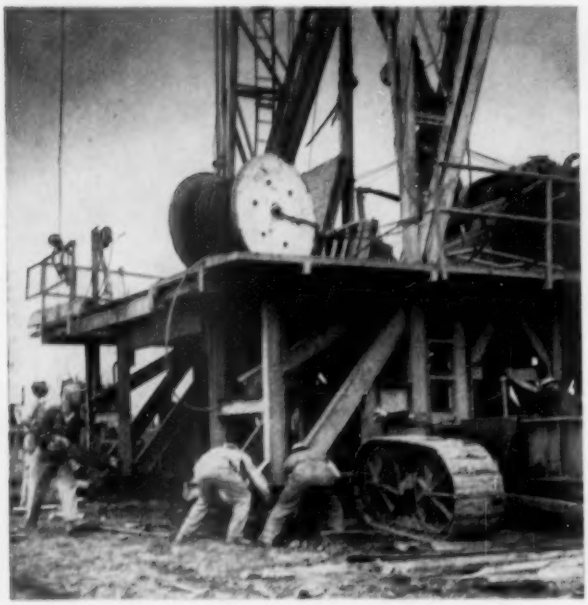
The discovery well, originally drilled as Royalite Albercan 1 Smiley, now named Royalite General American 1 Coleville, was drilled on LSD 4, 30-31-23w3, in August 1951. Sizable gas flows were recorded from the Viking sand and recovery of heavy oil was obtained in drill-stem tests from the Coleville (Banff) sand. The well was completed in the Coleville sand member of Mississippian age on September 21, 1951.

Initial drilling . . . Followup drilling was initiated immediately to outline the producing area and determine the areal extent of sand development. Drilling was carried out on a 20-acre spacing pattern. The initial program included the drilling 11 stepout wells at a distance varying from 1¼ to 1¾ miles from the discovery well. Seven of these wells were completed as oil producers from the Coleville sand and four were completed as Viking gas wells when the lower objective was found to be noncommercial. Two of the original seven oil wells were later recompleted as Viking gas wells due to water intrusion.

Offset drilling was carried out in conjunction with the stepout program in order to develop production capacity while locating markets and negotiating contracts for sale of the heavy crude. This initial program outlined a productive area of approximately 4,000 acres and developed a production capacity of approximately 1,000 bbl. per day. With sufficient reserves outlined, markets were obtained primarily for bunker fuel.

Construction of a topping plant was commenced by a privately owned company at Coleville in December 1952 and went on stream on March 20, 1953, with a capacity of 5,000 bbl. per day. Installation of the refinery increased market outlets for the production through the manufacture of asphalts; systematic development of the field was undertaken as the bunker fuel and asphalt markets increased. Subsequent drilling was carried out in four separate drilling programs, and by June 1955 the outlines of the pool had been essentially defined.

Drilling . . . Light portable rigs rated from 3,000 to 4,000 ft. are used with rig equipment generally consisting of a single 7 by 14-in. pump, 4½-in. drill pipe and using 9-in. bits. Blowout protection consists of a single positive shutoff preventer or a double-ram type. Thirteen-and-three-quarter-inch surface



Here is how two diesel trucks and a cat move the rig to the next drilling location

hole is usually drilled with water to casing point of 240 ft. Lost circulation has been encountered in several areas of the field on surface hole, but it is generally regained through addition of mud and in severe cases, lost-circulation material. Ten-and-three-quarter-inch casing equipped with a guide shoe, baffle collar, and one centralizer is cemented to surface with 175 sacks plus 2 per cent $CaCl_2$. An average of four bits is required to reach the top of the pay zone at 2,650 ft.

Hole difficulties are generally overcome by watering back as much as possible while drilling top hole and making an extra trip as soon as the sand is encountered. The mud viscosity is maintained at 35 seconds to the top of the Viking at 2,300 ft., and thereafter the solids allowed to build up to a maximum mud weight of 10.5 lb. per gallon. The addition of caustic and quebracho is initiated at 2,000 ft., which results in a water loss of 3 to 5 cc. by the time the pay zone is encountered. In the later programs, wells were drilled at the rate of one hole every 5 days, including moving and rig-up time.

Completion . . . Original completion practice consisted of setting casing at the top of the sand, waiting on cement 48 hours, and displacing the mud with oil after drilling out the sand. The remaining completion equipment was installed by service rigs. To minimize possible damage to the pay by drilling out with rotary, this practice was altered on two wells; the sand was drilled with cable tools from casing shoe to total depth. Difficulty in spudding out the sand in heavy oil and the occurrence of a gas cap at one location resulted in standardization on cased-through completions with careful control of the drilling fluid while drilling through the sand.

On these completions, 7-in. casing is run using double-float equipment, centralizers and rotary scratchers opposite the Coleville and the Viking sand. Casing is rotated during the job and cemented with 175 sacks plus 25 per cent gel. The plug is displaced with watered mud to the top of the float collar which is set below the base of the sand in overhole drilled for that purpose. Casing is landed immediately and the rig released for completion of the hole by service rig at a later date.

At that time, the drilling fluid is swabbed from the hole to float-shoe depth with a casing swab and the hole filled to 700 ft. subsurface with blended crude. The effective sand sections are selectively perforated using six bullets per foot. Recent wells were given sand-oil treatments on completion using 10,000 lb. of sand at ratios of 4 to 6 lb. per gallon, using blended Coleville crude as carrying agent.

All production equipment is standard throughout the field with the wells having 2½-in. tubing set approximately 100 ft. above the sand. Gas anchors are not used and the pump shoe is set one joint above bottom of the tubing. Standard-grade ¾-in. rods and 2-in. tubing-insert, top-lock pumps are run. The pump jacks of 80 A.P.I. size are equipped with 7½-hp. electric motors and controls. Wellheads consist of conventional series 400 flanged casing and tubing bowls. Flow lines of 3-in. diameter are laid out so that flow lines are common to two wells.

Gathering system . . . Oil gathering throughout the field is handled by a system of 4-in. lateral lines and two 6-in. trunk lines running the length of the field. Battery pumps consist of 4 by 6-in. double-acting positive-displacement pumps coupled to 10-hp. electric motors. Oil temperature is a critical factor in transportation and an indirect gas-fired line heater operates at the midway point on each trunk line. Wherever possible, tank temperatures are kept at approximately 100° F. to facilitate shipping.

Field operating pressures vary from a low of 125 psi. to maximum of 1,200 psi. during winter months. The entire gathering system consists of 7¼ miles of 4-in. and 6½ miles of 6-in. pipe which terminates at two 10,000-bbl. tanks adjacent to the refinery and loading rack at Coleville, from which the crude is transferred to tank cars or refinery storage as required.

Heavy-crude problems . . . Several op-

erational problems are encountered in Coleville due to the nature of the oil produced, which are not common in light-oil production. In general, handling of the crude is facilitated through either the use of pressure or reduction in viscosity by application of heat. In certain instances where this is not possible, the crude is diluted with light oil or a refinery product is used.

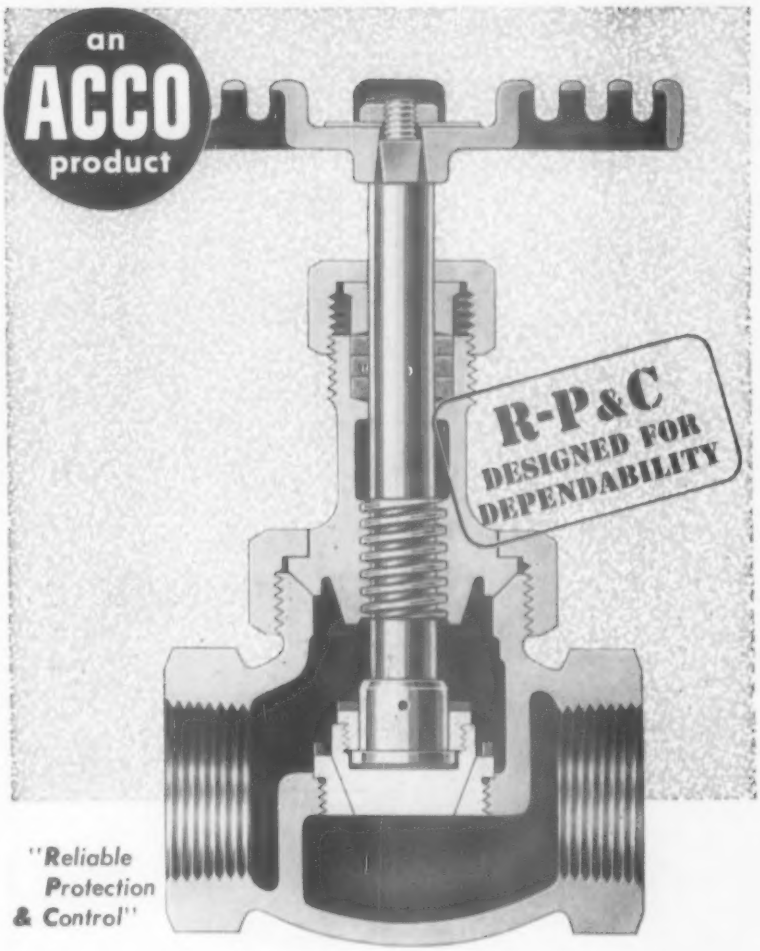
A major reoccurring problem is the circulation of sand accumulation from the producing wells. A sanded condition is indicated by failure of the pump to deliver and occasionally the hanging up of the rod string if the plunger seizes. The pump is pulled or stripped from the hole if necessary and the tubing circulated to bottom using warm lease crude. Spudding of the tubing may be required to remove sand bridges. The hole is backwashed with oil in excess of the hole volume and the tubing moved to original depth before rerunning the pump.

Liner installations have been required at several locations originally completed open hole. Two of these installations were to control caving conditions and five installations were for gas-oil ratio control where a gas cap was found to exist. Liners were cemented in place using the double-plug method in conjunction with a positive packoff liner hanger. All liner jobs have been considered successful.

Increasing production . . . Several means of production stimulation have been attempted. One completion was made with rotary tools and using crude oil as a circulating fluid. This well did not indicate that the manner of completion influenced production potential or that water block was a detrimental factor. Four mud-acid treatments failed to stimulate production. Both a low-volume and a high-volume oil fracture using lease crude was carried out on a selected well without effect. A later sand-oil treatment of 10,000 lb. sand

THE AUTHOR

D. D. Wright, district production superintendent, Royalite Oil Co., Ltd., is a native of Turner Valley and graduate of University of Alberta in chemical engineering. He was employed by Royalite in Turner Valley July 11, 1942. In 1949 he was promoted to petroleum engineer and later he returned to Turner Valley as district engineer. On October 1, 1953, Wright was made district production superintendent at Coleville and has been in charge of Royalite's field operations there ever since. He supervised the company's recently completed 75-well development program which gave Royalite a total of 205 producing oil wells in Coleville field.



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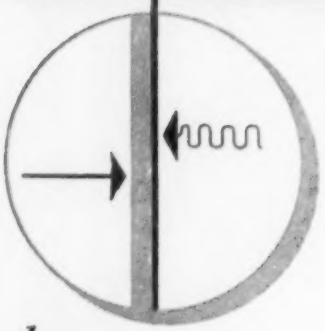

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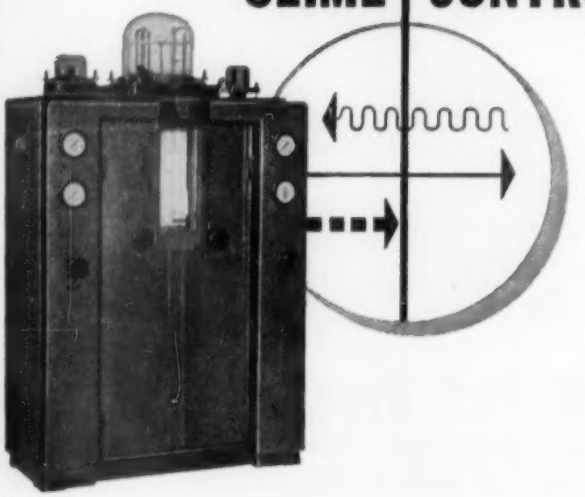

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TABLE 1—PRODUCTION BY YEARS

Year—	Total prod. (bbl.)
1951	12,618
1952	275,010
1953	730,413
1954	1,054,091
1955	*660,184

*Six months.

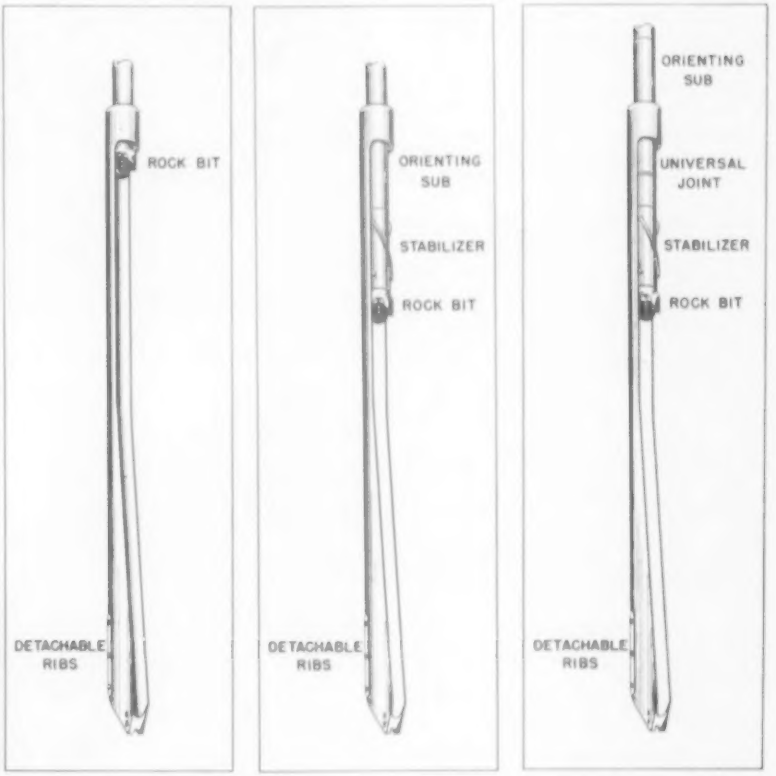
at this well increased the production capacity from 19 to 69 bbl. per day, which production was sustained for a period of several months. The carrying agent was a blend of lease crude and a low-viscosity bunker fuel.

Subsequent treatment of 21 producing wells was carried out using the same amount of sand in concentrations varying from 4 to 6 lb. per gallon, with a resulting average increase in productivity of 25 to 30 per cent. Recent completions have been treated prior to placing wells in production. While benefit of the treatment cannot be evaluated quantitatively, it is considered that the initial potential of these wells has exceeded that obtained from wells not treated. Treatment upon completion requires the use of a packer and holddown due to the fact that the breakdown pressure, which varies from minimum of 2,000 to a maximum of 3,500 psi., is in excess of safe working limits of the casing. Treatment of previously produced wells has been carried out down the casing without removal of production equipment at breakdown pressures of 1,200 to 1,800 psi. Sand fracturing is considered to be a profitable method of treatment with payouts of 3 to 4 months.

Reservoir characteristics . . . Data obtained during the drilling and production of the field indicated an original bottom-hole pressure of 1,050 psia. at 84° F. The average sand thickness is 60 ft. with 25 net effective feet of pay, having an average porosity of 26½ per cent and an average permeability varying from 30 to 760 md. Connate water from electric log has been calculated at 15 per cent and the shrinkage factor determined as 7 per cent. Viscosity of the 13.7° A.P.I. crude is 350 cp. at reservoir conditions. Four local gas caps have been encountered in the field associated with local structural highs and having gas-oil contacts at various elevations. A definite water-oil contact has not been established but the water saturation increases towards the south edge of the field and marks the limit of economical production in that direction.

Table 1 indicates the annual oil produced since discovery. Maximum daily oil production after development is completed is estimated to be 7,000 bbl. per day.

TEXACO drills slant holes from a man-made island composed of clay.



STANDARD WHIPSTOCKS are used on Pembina wells. Fig. 1A (left) shows the whipstock; Fig. 1B (middle), orienting sub, stabilizer, and bit; Fig. 1C (right), position of universal joint.

Directional Drilling a Natural for Pembina

Problems of terrain and weather provide made-to-order condition for whipstocking

by A. G. G. de Chastelain
Eastman Oil Well Survey Co., Ltd.

MUSKEG on the grand scale, combined with the North Saskatchewan and Pembina rivers, which intersect Pembina oil field, plus heavy rainfall and bad drainage, render many well locations inaccessible and provide excellent conditions for the use of controlled directional drilling.

This technique has not hitherto been widely employed in Canada and in the minds of some Canadian field men a whipstock spells trouble rather than a relatively easy solution to a problem. Pembina development, however, is in its early stages, and as more cost figures from wells drilled under directional control become available, there is little doubt that technique will be expanded.

The information which follows is based upon the limited experience obtained from four holes drilled during the last 3 months. These wells have served to show how the formation reacts to different drilling hookups at various r.p.m.'s and loads and to establish the best mud conditions for good penetration under control of drift and direction.

Field conditions . . . Pembina is the second-largest producing field in Canada. Discovered in July 1953, it now covers an area of over 670 sq. miles. Production is from the Cardium zone at 4,600 ft. in the east to 5,700 ft. in the west. Over 450 development and wildcat wells have been drilled in the space of 2 years.

Generally speaking, the formations above the Cardium zone present no difficult problems in whipstocking. Penetration rate in the same horizons varies considerably but in none of the formations above the Cardium is drilling hard. There is some indication that the northeast to southwest dip of the formation tends to turn the hole towards the east. Insufficient data are available, however, to state this with emphasis. On the longer kicks there is a tendency to keyseat. This was readily overcome by using a wall reamer in the string and in one case by using a keyseat tool.

The target area, as defined by the Alberta Oil and Gas Conservation Board, is a square, the side dimensions

being 330 ft. + 4 per cent of depth to the top of the producing zone. At a depth of 5,000 ft., therefore, the target area will be 730 ft. square at the top of the production zone. This permits some latitude in selecting the best point of entry to the target area, taking into account the position of the rig in relation to the target area to be drilled.

Oil-emulsion mud embodying local crude is used from a depth of 2,000 to 2,500 ft. The crude should be added to the mud at least 2 days before the first deflecting tool is run. When directional control starts above 2,000 ft., the cuttings and cavings in the fluid column are not sufficient to cause difficulty in running the whipstock to bottom. At a depth of 4,000 ft., however, strict control of mud condition is necessary to lift cuttings and cavings from hole and to keep sands in suspension. In particular, viscosity should be raised to around 100 and gel strength kept low. The water loss of this oil-emulsion mud is of the order of 4 cc. and weight between 10 and 12 lb. per gallon. In these conditions, penetration rate is scarcely affected.

Directional Drilling

The standard Eastman whipstock was used in all cases (see Fig. 1). Drilling off the tool was done with a stabilizer above the tricone bit and a drill-pipe single above the stabilizer. In Jobs 1, 2 and 3 (see Table 1), drift angle was built up at the rate of 2½° per 100 ft., and maintained, with minor corrections, to bottom. In Job 4, angle was increased at a rate of 2° per 100 ft. At the whipstocking point on Jobs 1, 2 and 3, the drift was 15 ft., 30 ft., and 15 ft. respectively. In Job 4, however, drift angle was 1° in direction N. 59° W., necessitating a change of direction of 149°. The setting of two whipstocks at an interval of 160 ft. avoided the formation of a dog leg. Throughout all four jobs, drift and direction were checked by single-shot surveys run in K-monel drill collar at intervals of approximately 30 ft. Control of direction and drift required 22 changes of drilling hookup on Job 1, but of only 18 on Job 2. Experience gained on these two wells will enable this figure to be further reduced and more control to be based upon weight and rotary-table speed. Pembina, with its large area of more or less consistent formations, lends itself to the practical use of statistical information tabulated on the completion of each controlled directional job. This has been done for Jobs 1 to 4, along these lines:

TWO RIVERS, the Pembina (above) and the Saskatchewan, combine with the muskeg to make many Pembina locations well-nigh inaccessible.

ALTHOUGH NEW ROADS are being built into Pembina, most of them are passable only when frozen. Spring thaws make the roads mudholes.

T.V.D.	Drift	Change of Drift		Direction	Change		Weight	RPM	Drilling Hook-up	D
		+	-		L	R				

In the above table, D is the distance from bit bottom to the center of the stabilizer blades, a key dimension which is under careful study. The table is completed after each single shot survey and provides an immediate guide to the bottom assembly, weight, and r.p.m. required to produce the necessary

TABLE 1—DATA ON FOUR DIRECTIONALLY DRILLED WELLS IN PEMBINA
(in order in which they were drilled)

Job No.—	1	2	3	4
Kickoff point, ft.	1,500	1,700	4,140	4,404
Hole size, in.	8¾	9	9	8¾
Total controlled footage, ft.	4,137	3,975	1,010	985
Horizontal displacement, ft.	1,559	1,556	205	218
Maximum angle	31°	32° 30'	15°	20° 15'
Direction	S. 58° W.	S. 32° E.	S. 29° E.	E.
Total days	21	14	9	10
Average ft. per day	197	284	105.8	98.5
Whipstocks used	2	1	2	2
Changes of drilling hookup	22	18	10	11
Maximum angle	31	32° 30'	15°	20° 15'
Drilling time, hours	281	198	142	110.50
Surveys, hours	44	31	18	21.25
Trip time, hours	128	67	49	46
Rig service, hours	6	12	0	5.75
Repairs, hours	5	0	3.50	3.75
Reaming, hours	8	16	11	12.75
Conditioning mud, hours	21	12	2.50	14.50
Method of orientation	B	B	B	A & B

A. Bottom-hole method.
B. Stokenbury sighting clamps.

change of drift and/or direction on wells drilled in the quadrants in which experience has already been obtained. Plotted in graph form, the information shows that in holes drilled towards the southeast and southwest there is a tendency to turn to the left which is updip. The dip in formation is between 30 ft. per mile to the east and 60 ft. per mile to the southwest.

Island Drilling

In areas of deep muskeg where road building is prohibitively costly or impossible, the man-made island drilling site is the only solution. Texaco Exploration Co. has pioneered this method by constructing an island of clay 400 ft. wide by 550 ft. long. At the time of writing, only one directional well has been drilled from this island (No. 2 in the table). All directional tools and supplies were sent in while the roads were frozen and shortly before the imposition of road bans which stop all field traffic at the breakup in spring. The operator, who drilled on Job 2, considers the Pembina-Cynthia formations ideal for directional drilling. Once off the whipstock and facing in the right direction, there was no difficulty in building the necessary angle and in holding angle and direction down to the target area. And the record of 4,000 ft. of directional hole, kicked 1,550 ft. in 14 days, will almost certainly be bettered.

In planning a directional-drilling program from an island in Pembina field, with its attendant transportation problems and risk of becoming cut off from supplies by rain or thaw, there is no room for errors or omissions. The rig must be rated sufficiently high to support the weight of extra drill pipe required for the hole with the longest deviation from vertical. Account must also be taken of the drag of the pipe

THE AUTHOR

A. G. G. de Chastelain, in charge of operations for Eastman Oil Well Survey Co., Ltd., Calgary, Alta., is a native of London, England. He took a degree in engineering at London University in 1927 and then proceeded to the oil fields in Rumania where he stayed until 1940. De Chastelain was dropped by parachute into Rumania in 1943 on a politico-military operation and as a result became persona non grata with the U.S.S.R. authorities and was barred from further entry to Rumania. He joined Eastman International Co. in 1953 and has been in charge of Eastman operations in Canada since January 1955. He is analyzing directional drilling and diamond coring data with a view to establishing optimum working conditions in principal Canadian formations.

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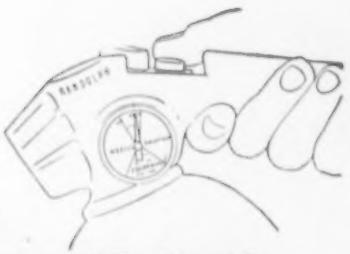

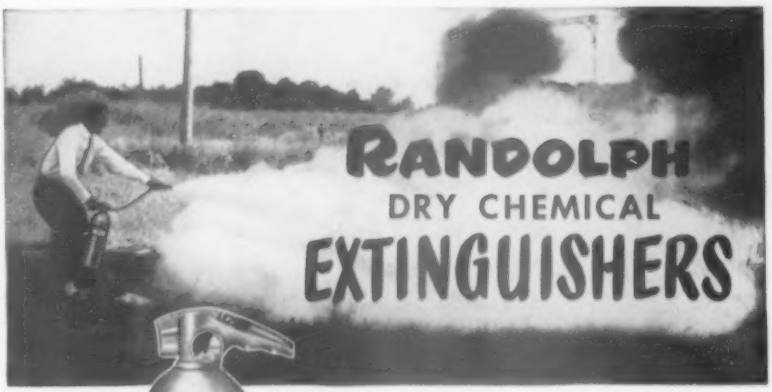

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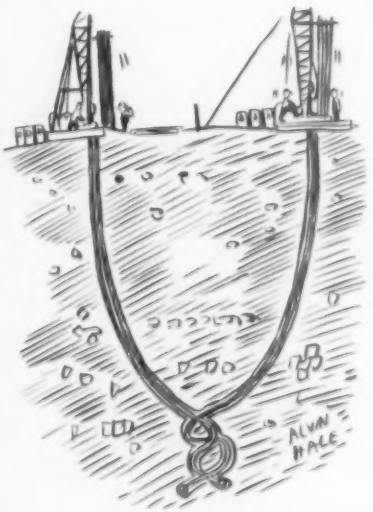
against the curve of the hole which may reach 20,000 lb. At least six, and preferably more, steel drill collars should be available on the rig to assist in the control of direction and angle while maintaining a high rate of penetration. Close control of mud condition calls for a large pump and a standby pump is recommended. A reliable weight indicator will remove all guess work, for which there is no place in controlled directional drilling. Sufficient sand line must be available for surveying to the total measured depth of the longest hole. Finally, a good crew is all important in cutting down rig time resulting from the extra trips required during controlled operations.

Costs . . . During 2 years of straight-hole drilling in Pembina, rig time from spud to release has been reduced by over 40 per cent. At this early stage of directional drilling in Pembina it would be imprudent to estimate the extent to which present costs can be improved. Four directional operations have averaged $1.58 per foot drilled and this figure will certainly be reduced in the course of further experience.

Pembina presents no major difficulties in directional drilling. Penetration rates close to those of straight-hole drilling are possible. Kicks of 3,000 ft. and over can be undertaken. A review of the situation 12 months from now will be of interest and value.

Acknowledgment . . . The information in this article is based upon the drilling and other reports and observations of Directional Drilling Engineers J. C. Cox, D. J. Jenkins, and N. C. Christoffersen.



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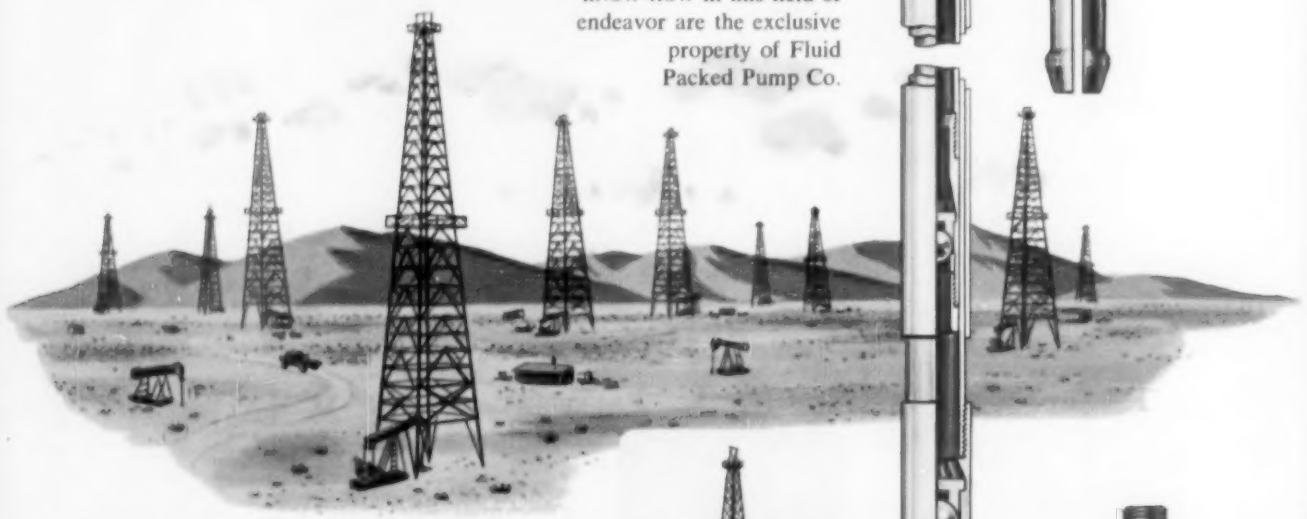

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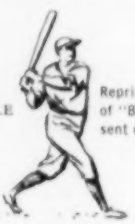

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New Crankcase Ventilation System

. . . for drilling engines and oil-field use

by R. A. Shogren

A NEW crankcase-ventilation system has been developed for oil-field engines. It has these advantages:

- Elimination of crankcase back pressure, thus reducing oil leaks.
- Substantial reduction of motor-oil dilution.
- Extension of motor-oil and oil-filter life.
- Extension of spark-plug life.
- Improvement of engine performance.
- Extension of engine life by improving internal engine cleanliness.

Several tests on industrial engines in the field bear out these points.

What is blowby? . . . All internal-combustion engines have some blowby, and some types much more than others. Blowby vapor contains unburned fuel, water vapor, and other substances which, if not removed from the crankcase, will eventually condense in the motor oil causing dilution and contamination.

Tests have been made in which clean strips of copper and steel were suspended in blowby vapors for a period of time, and the corrosion and etching of these strips which took place gave definite evidence of harmful substances contained in blowby vapor. Crankcase ventilation then, becomes simply a problem of removing blowby vapors, before their damaging effects can take place.

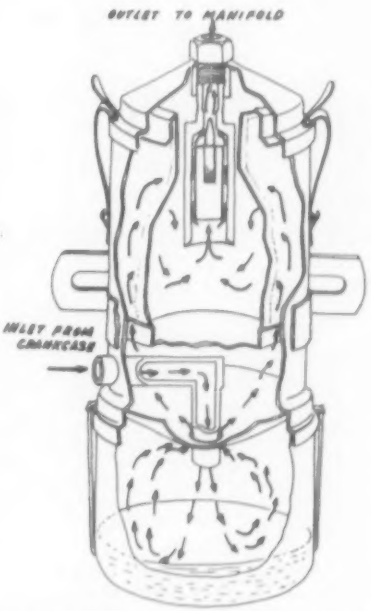
Other systems . . . Several different systems of crankcase ventilating systems are in use today. Some of these are positive-acting systems, while others merely provide an opening in the crankcase allowing the blowby vapors to escape, usually through a ribbon-type air filter or some similar device, which is provided to prevent dirt from entering the crankcase. This type of system is susceptible to plugging up, which then allows the blowby vapor to condense in the motor oil, causing sludge, varnish, and other deposits which often are the forerunners of serious mechanical troubles.

Another system employs the manifold vacuum to draw blowby vapor from the crankcase into the intake manifold, usually through a metering valve. This system is positive acting, but has the disadvantage of introducing the same harmful substances into the top of the engine which were removed from the crankcase.

Positive blowers are available which force fresh air into the crankcase and force blowby out another opening. This system, while giving positive ventilation, has the disadvantage of increasing crankcase pressure and the tendency for oil leaks, which of course is undesirable.

New System

In this new system intake manifold vacuum is utilized to draw blowby vapors from the crankcase through a specially designed condensing chamber and a finely woven filtering element (see Fig. 1). Next the vapors are drawn through a specially developed metering valve and are introduced back into the combustion chamber through the intake manifold. Since the crankcase has been placed under suction, a large fresh-air entrance, incorporating an oil-bath air cleaner, is provided so that no appreciable vacuum which could cause excessive oil consumption is produced in the crankcase.



NEW CRANKCASE-VENTILATION system for oil-field engines. Fig. 1.

Instead, a controlled flow of air under slightly less than atmospheric pressure is induced in the crankcase. The air entrance is at the opposite end of the crankcase from the suction line to the ventilating unit, so that almost complete scavenging of crankcase vapors can be accomplished. Also, since the crankcase is under a very slight vacuum, oil leaks caused by crankcase pressure are largely eliminated.

As the blowby vapors are drawn through the condensing chamber, water, varnish, tar, and the heavy ends of unburned fuel are trapped and deposited in this chamber. Also very fine carbon which is in suspension in crankcase vapor is trapped in the condensing chamber. The filtering element then traps the lighter ends of tar, varnish, etc., which do not deposit in the condensing chamber, while cleaned unburned fuel vapors, and oily steam vapor from the crankcase are passed through the element and metering valve for reuse, which results in a slight decrease in fuel consumption.

The only steam vapor injected into the combustion chamber has the effect of washing valve faces and seats clean of carbon deposits, and also has a cleaning effect on spark-plug electrodes. Test results so far have revealed that general engine internal cleanliness heretofore unknown can be achieved with this ventilating system, and some interesting possibilities in actual engine design follow as a natural result.

Field test results . . . Several tests have been carried out after this ventilating system was installed on industrial engines in the field.

Test No. 1—Six-cylinder overhead-valve, natural-gas, industrial engine. The engine was a new engine in a distributor's stock and had never been run since going through test at the factory. After a 30-minute run, compression was checked as follows:

125 122 125 130 130 129.

The engine was then shut down and

Author is oil-field engineer for Allis-Chalmers Manufacturing Co., Buda Division.

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the new-type ventilating system was installed and compression readings were taken after another 30-minute test run, as follows:

130 130 130 130 130 130.

The interesting thing about this test was that the engine had evidently built up in just the regular run-in, a slight amount of deposits under the valves, enough to cause the compression variation shown in the first test, and the washing action of the oily steam inducted from the crankcase cleaned the valves and seats, resulting in a leveling out of compression.

Test No. 2—Six-cylinder overhead-valve, natural-gas, industrial engine. This engine was owned by a major oil company and had been in service several thousand hours, and was scheduled for an overhaul. The engine was started and thoroughly warmed up, and then compression readings were taken as follows:

130 135 80 50 105 123.

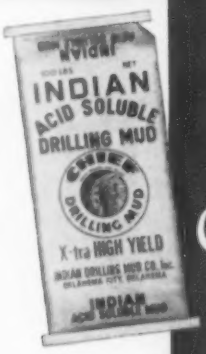
The new ventilating system was then installed and the engine was run for 40 minutes and compression was again checked as follows:

141 148 145 140 145 141.

In this case, sticking valves, which caused the low compression, were freed up and a general leveling out of compression was accomplished. There was also a noticeable improvement in spark plug condition.

Acknowledgment . . . Much credit is due to Oildex Corp. Oildex engineers worked quite closely with Allis-Chalmers engineers in developing the new system.

"I wonder whose future they're talking about."



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The Journal presents its annual survey of contract prices, drilling data, and other valuable information on 65 of the most active fields in the country. These drilling reports represent the average or normal drilling conditions and prices for a given field. These reports will serve as a useful guide in figuring costs, setting up a drilling program, or submitting bids.

Rocky Mountains

BLANCO FIELD
San Juan Basin, New Mexico

Pay zone	Mesa Verde
TD (avg.)	5,800 ft.

Footage price	$5.00
Day-work rate with drill pipe	$600.00
Day-work rate without drill pipe	$675.00

Normal Rig-Time Distribution

Days on footage rate	14
Days on day-work rate	6
Total days (spud to rig release)	20

Bit Data

Total number of bits	18
Feet per bit	180-350

Equipment

9,000-12,000-ft. class rigs.
6,000-9,000-ft. class rigs.
3,000-6,000-ft. class rigs
Cable tools.
Usual fuel: Diesel and natural gas.
Water supply: Sumps and rivers. Hauling and pumping.
Nearest supply center: Farmington, N. M.
Terrain and roads: Terrain is broken and hilly. Roads are good considering the terrain.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	170	125
Oil string	7	5,100	500

Mud Summary

Material—	Amount
Quebracho, lb.	1,000
Caustic soda, lb.	250
Soda ash, lb.	1,000
Gel, lb.	24,000
Lost-circulation material (fiber), sacks	200
Lost-circulation material (cottonseed hulls), lb.	8,000

Usual mud program: Drill to approximately 3,000 ft. with clear water and natural mud; then mud up to 9.8 bbl. per gal. and continue to casing seat. After setting casing, natural gas is used to drill the pay section.

Geological Data

Formation tops—	Depth (ft.)
Kirtland shale	2,700
Fruitland	2,940
Pictured Cliffs (gas producer)	3,360
Lewis	3,430
Mesaverde	5,190
Cliff House (sandstone)	5,190
Menefee	5,280
Point Lookout	5,640
Mancos	5,800

GARLAND FIELD
Big Horn County, Wyoming

Pay zone	Tensleep sand and Madison ls.
TD (avg.)	4,700 ft.

Cost Data

Footage price	$8.00
Day-work rate with drill pipe	$800.00
Day-work rate without drill pipe	$750.00

Normal Rig-Time Distribution

Days on footage rate	30
Days on day-work rate	10
Total days (spud to rig release)	40

Bit Data

Total number of bits	35
Feet per bit	135

Equipment

3,000-6,000-ft. class.
Usual fuel: Gas.
Water supply: Field wells.
Nearest supply center: Powell, Wyo.
Terrain and roads: Hills and oiled roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	300	250
Oil string	7	4,500	500

Mud Summary

Material—	Amount
Wyoming bentonite, lb.	20,000
Quebracho, lb.	500
Caustic, lb.	500
Oil, bbl.	100

Usual mud program: Mix to 60 viscosity, add quebracho and caustic at 2,500 ft. until viscosity breaks to 45; wt. 9.5, viscosity 45, pH 9, F.C. 2/32, water loss 10; add 20 per cent oil and complete drilling.

Geological Data

Formation tops—	Depth (ft.)
Peay sand	775
Dakota sand	1,715
Lakota sand	1,830
Sundance sand	2,292
Gypsum Springs	2,625
Red Beds	2,725
Dinwoody formation	3,190
Embar lime	3,227
Tensleep sandstone	3,343
Madison limestone	3,589

HAMILTON DOME
Hot Springs County, Wyoming

Pay zone	Tensleep sandstone
TD (avg.)	3,200 ft.

Cost Data

Footage price	$6.50
Day-work rate with drill pipe	$700.00
Day-work rate without drill pipe	$650.00

Normal Rig-Time Distribution

Days on footage rate	25
Days on day-work rate	5
Total days (spud to rig release)	30

Bit Data

Total number of bits	28
Feet per bit	110

Here are fields reported on in this section

Rocky Mountain fields . . . Blanco, Garland, Hamilton Dome, Jackpot, Northwest Graylin, Pinedale, Plum Bush Creek.

West Texas . . . Amacker-Tippett, Andrews, Deep Rock Ellenburger, Donnelly, Dora Roberts Trend, Garza, Hulldale, Huntley, Jameson, McElroy, Midland Farms (Ellenburger), Nolley, North Russell (Devonian), Parochial-Bade, Prentice, Puckett.

Texas Panhandle . . . Hitchland, West Panhandle.

North Texas . . . Aries, Big Mineral, Herr-King, Noodle, Sherman area.

Texas Gulf Coast . . . Chocolate Bayou.

Southwest Texas . . . Crown East, Luling-Branyon, Longwood, Neches.

South Louisiana . . . Church Point, East Lake Palourde, Hollywood, Leeville, Northwest Branch, Rayne, Weeks Island, South Pass Block 24.

North Louisiana . . . Caddo-Pine Island, Cottage Grove, Cotton Valley, Greenwood-Waskom.

Mississippi . . . Bolton, Pistol Ridge-Maxie, Soso.

Oklahoma . . . Bradley, Camrick, Chickasha, Hoover area, Keyes, Little Chief area (West), Mocane, Southeast Moore, West Short Junction, Golden Trend, Greenwood.

Illinois . . . Roland.

Canada . . . Joffre, Midale, Rimbey.

EQUIPMENT

3,000-6,000-ft. class.
Usual fuel: Diesel.
Water supply: Operators supply water.
Nearest supply center: Thermopolis, 25 miles.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	150	100
Oil string	7	3,100	300

Mud Summary

Material—	Amount
Gel, sacks	525
Caustic, lb.	500
Quebracho, lb.	1,000
Sawdust, yd.	5
Driscose, lb.	100

Usual mud program: Clay base to pay where mud is changed over to high pH red. crude oil added; mud necessary from surface down.

Geological Date

Formation tops—	Depth (ft.)
Cretaceous	Surface
Jurassic	900
Triassic	1,575
Permian	2,750
Pennsylvanian	2,950

JACKPOT FIELD
Morgan County, Colorado

Pay zone	"D" sand
TD (avg.)	6,500 ft.

Cost Data

Footage price	$3.00
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	8
Days on day-work rate	6
Total days (spud to rig release)	14

Bit Data

Total number of bits	7
Feet per bit	930

Equipment

6,000-9,000-ft. class.
Usual fuel: Butane or diesel.
Water supply: Furnished by contractor.
Nearest supply center: Fort Morgan, Colo.
Terrain and roads: Terrain, rolling; roads, fair to good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	250	150
Oil string	5½	6,500	275

Usual mud program: Native muds with viscosity controls to coring point at approximately 6,400 ft. Commercial muds to total depth. Mud cost is approximately $1,500.

Geological Data

Formation tops—	Depth (ft.)
Niobrara	5,740
Fort Hays	6,000
Carlile	6,023
Greenhorn	6,090
Bentonite	6,348
"D" sand	6,450

NORTHWEST GRAYLIN FIELD
Logan County, Colorado

Pay zone	"D" sand of Graneros series*
TD (avg.)	5,100 ft.

Cost Data

Footage price	$2.80
Day-work rate with drill pipe	$600.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	7
Days on day-work rate	2
Total days (spud to rig release)	10

Bit Data

Total number of bits	4-5
Feet per bit	1,000-1,300

Equipment

6,000-9,000-ft. class.
Usual fuel: Butane and natural gas.
Water supply: Ponds or hauling by truck.
Nearest supply center: Sterling, Colo.
Terrain and roads: Flat, graded, gravel.

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	200	160
Oil string	5½	5,100	150

Mud Summary

Material—	Amount
Bentonite, sacks	85
Caustic, lb.	300
Quebracho, lb.	500
Phosphate, lb.	250
Driscose, lb.	200
Soda ash, lb.	300

Usual mud program: Natural mud to 4,000 ft. Mud viscosity 90 – sec.; water loss below 6 cc. for coring and testing.

Geological Data

Formation tops—	Depth (ft.)
Niobrara	4,047
Fort Hays	4,385
Carlile	4,430
Greenhorn	4,630
"D" sand	4,880
"J" sand	4,985
Skull Creek	5,075

*The "D" sand is the principal producing zone, but a few wells are complete in the "J" sand.

PINEDALE FIELD
Sublette County, Wyoming

Pay zone	Fort Union
TD (avg.)	10,500 ft.

Cost Data

Footage price	$8.00
Day-work rate with drill pipe	$975.00
Day-work rate without drill pipe	$900.00

Normal Rig-Time Distribution

Days on footage rate	50
Days on day-work rate	30
Total days (spud to rig release)	80

Bit Data

Total number of bits	85
Feet per bit	124

Equipment

9,000-12,000-ft. class.
Usual fuel: Natural gas and butane.
Water supply: Wells or pumped from river.
Nearest supply center: Rock Springs, Wyo.
Terrain and roads: Terrain is rolling hills with good roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	350	350
Intermediate	9⅝	7,700	500
Oil string	7	10,000	900

Mud Summary

Material—	Amount
Gel, lb.	162,300
Driscose, lb.	9,050
Sodium bicarbonate, lb.	500
Barites, lb.	535,900
Tetra-sodium pyrophosphate, lb.	900
Sodium-acid pyrophosphate, lb.	2,250
Lost-circulation material, lb.	600

Usual mud program: Drill with water and natural mud to approximately 6,000 ft. Mud (10 lb./gal.) is then used to the intermediate casing seat. After drilling out from under intermediate casing, mud is gradually increased to 13-13.5 lb./gal. until TD is reached.

Geological Data

Fort Union—interbedded shales and sands	7,700

Remarks: Information is somewhat limited, because of lack of drilling data.

PLUM BUSH CREEK FIELD
Washington County, Colorado

Pay zone	"J" sand
TD (avg.)	5,050 ft.

Cost Data

Footage price	$2.75

Normal Rig-Time Distribution

Days on footage rate	7
Days on day-work rate	1
Total days (spud to rig release)	8

Bit Data

Total number of bits	5
Feet per bit	1,000

Equipment

6,000-ft. class.
Usual fuel: Butane.
Water supply: Ponds.
Nearest supply center: Fort Morgan.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	120	150
Oil string	5½ (15.5 lb. J-55)	TD	100

Mud Summary

Material—	Amount
Aquagel, tons	3
Oil, bbl.	100

Usual mud program: On reaching pay: weight 10 lb. per gal., viscosity 100 sec. per qt., water loss 3 to 5 cc. in 30 minutes.

Geological Data

Formation tops—	Depth (ft.)
"D" sand	4,890
"J" sand	4,920

West Texas

AMACKER-TIPPETT FIELD
Upton County, Texas

Pay zone	Ellenburger
TD (avg.)	12,150 ft.

Cost Data

Footage price	$7.50
Day-work rate with drill pipe	$1,000.00
Day-work rate without drill pipe	$900.00

Normal Rig-Time Distribution

Days on footage rate	71
Days on day-work rate	40
Total days (spud to rig release)	111

Bit Data

Total number of bits	107
Feet per bit	113

Equipment

12,000-15,000-ft. class.
Usual fuel: Butane or gas.
Water supply: Wells.
Nearest supply center: Rankin and McCamey, Tex.
Terrain and roads: Flat open country; pavement vicinity of field; caliche lease roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	11¾	323	375
Intermediate	8⅝	4,600	2,400
Oil string	5½	12,150	550

Mud Summary

Material—	Amount
Aquagel, lb.	197,400
Tannex, lb.	10,400
Caustic soda, lb.	8,700
Soda ash, lb.	3,600
Fibertex, lb.	17,480
Salt, lb.	75,000
Smentox, lb.	1,000
Baroid, lb.	2,000
Jelflakes, lb.	4,750
Zelgel, lb.	12,500
Anhydrox, lb.	2,000
Lime, lb.	400

Usual mud program: Drilled with salt water mud until intermediate casing set; with clear water to about 7,000 ft.; mudded up and drilled with mud weight from 8.8 to 9.1 lb. and viscosity from 44 to 150.

Geological Data

Formation tops—	Depth (ft.)
Anhydrite	1,461
Yates	2,525
Grayburg	4,365
San Andres	4,496
Spraberry	7,065
Dean	8,188
Wolfcamp	8,290
Strawn	9,403
Bend	9,587
Barnett	9,785
Woodford	10,224
Devonian	10,390
Silurian	11,196
Fusselman	11,219
Montoya	11,305
Simpson	11,403
Ellenburger	11,964

ANDREWS FIELD
Andrews County, Texas

Pay zone	Wolfcamp and Pennsylvanian (Dual)
TD (avg.)	9,172 ft.

Cost Data

Footage price	$6.40
Day-work rate with drill pipe	$800.00
Day-work rate without drill pipe	$700.00

Normal Rig-Time Distribution

Days on footage rate	45
Days on day-work rate	15
Total days (spud to rig release)	60

Bit Data

Total number of bits	54
Feet per bit	170

Equipment

9,000-12,000-ft. class.
6,000-9,000-ft. class.
Usual fuel: Butane.
Water supply: Wells.
Nearest supply center: Andrews.
Terrain and roads: Level terrain; good roads, graded occasionally.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	267	*400
Intermediate	9⅝	4,605	(†)
Oil string	7⅝	4,475-9,168	(‡)

*Four per cent gel. †2,500 sacks 4 per cent mixed 1:1 (volume ratio) with stratacrete plus 200 sacks neat. ‡500 sacks 4 per cent plus 200 sacks neat.

Mud Summary

Material—	Amount
Fibertex, sacks	59
Aquagel, sacks	14
Carbonax, sacks	13
Soda ash, sacks	3
Jelflake, sacks	6
Caustic soda, sack	1
Total cost	$3,780

Usual mud program: Natural mud to 1,300 ft.; saturated salt solution below 1,300 until set 9⅝ in. at 4,600 ft. Replace salt water with fresh water at 4,600 ft. Maintain viscosity 35-40 sec. below 4,000 ft.

Geological Data

Formation tops—	Depth (ft.)
Rustler	1,960
Yates	3,100
San Andres	4,650
Glorieta	5,850
Wolf lime	8,280
Wolf pay	8,560
Detrital	8,690
Pennsylvania	8,940
Pennsylvania Pay	9,050

DEEP ROCK ELLENBURGER FIELD
Andrews County, Texas

Pay zone	Ellenburger
TD (avg.)	12,200 ft.

Cost Data

Footage price	$9.35
Day-work rate with drill pipe	$950.00
Day-work rate without drill pipe	$825.00

Normal Rig-Time Distribution

Days on footage rate	90
Days on day-work rate	8
Total days (spud to rig release)	98

Bit Data

Total number of bits	100
Feet per bit	122

Equipment

12,000-15,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells.
Nearest supply center: Andrews.
Terrain and roads: Flat. Good caliche surfaced roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	365	450
Intermediate	8⅝	4,520	2,695
Oil string	5½	12,175	1,100

Mud Summary

Material—	Amount
Jel, tons	75
Lost-circulation material, tons	5
Soda ash, tons	5
Caustic soda, tons	1
Quebracho, tons	2

Usual mud program: Water to 7,500. Gel-oil to total depth.

Geological Data

Formation tops—	Depth (ft.)
San Andres	4,257
Clearfork	5,939
Mississippi	9,420
Devonian	9,973
Silurian	11,130
Simpson	11,700
Ellenburger	12,154

DONNELLY FIELD
Ector County, Texas

Pay zone	San Andres
TD (avg.)	4,350 ft.

Cost Data

Footage price	$3.50
Day-work rate with drill pipe	$700.00
Day-work rate without drill pipe	$1,000.00

Normal Rig-Time Distribution

Days on footage rate	13
Days on day-work rate	4
Total days (spud to rig release)	18

Bit Data

Total number of bits	12
Feet per bit	350

Equipment

3,000-6,000-ft. class.
Usual fuel: Gas.
Water supply: Wells.
Nearest supply center: Odessa.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	200	100
Oil string	5½	4,350	200

Mud Summary

Usual mud bill: Approximately $1,000.00.

Geological Data

Formation tops—	Depth (ft.)
Grayburg	4,175
San Andres	4,300

DORA ROBERTS TREND FIELD
Midland County, Texas

Pay zone	Ellenburger
TD (avg.)	13,200 ft.

Over
50
Locations in the United States and Canada

McCullough® REPORTS TO THE OIL INDUSTRY

Service
Anywhere Anytime

New Services • • • New Tools • • • New Methods • • • Outstanding Results

Locates Pay Sand Missed by Electric Log

In a shallow well in Oklahoma the McCullough Radiation Well Log picked up 23' of pay that had been missed by an electric log.

The electric log had picked a hard limestone as the pay zone. 5½" O.D., 14 lb. casing was set to bottom. Limestone formation was perforated and found dry. Then McCullough was called to run a Gamma Ray Log. At approximately 1100', and just below the hard limestone, the McCullough Log picked up 23' of shaley pay sand. This entire productive zone had been missed by the electric log.

The accurate and reliable information supplied by the McCullough Radiation Well Log (Gamma Ray and Neutron Curves) provides a sound basis for perforating for completion . . . always Log AND Perforate by McCullough.

Efficiency of McCullough Services Saves Operator Valuable Rig Time

Only 7½ hours were required to log, perforate and set a packer in this Texas well. 5½" O.D., 17 lb. casing was cemented at 7716'. Well was logged by McCullough from 7716' to 5000', obtaining gamma ray and neutron curves and recording a simultaneous collar log. Twenty McCullough Standard Casing Glass Jets, four per foot, were shot in the interval from 7482' to 7487'. This was followed by setting a production packer at 6410'.

In this series of operations there was no delay of any kind – a tribute to the efficiency of McCullough tools and instruments and to the skill of McCullough service crews.

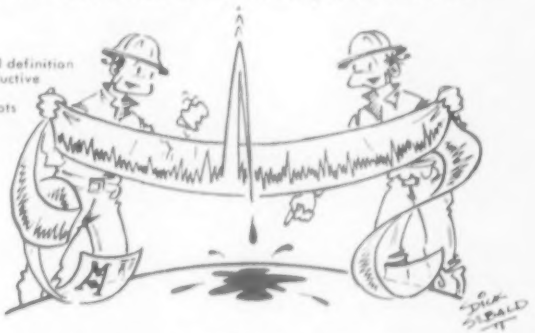
$2,433.21 SAVED

Accuracy of McCullough Radiation Well Log Prevents Wasting 390 Perforating Shots in Non-productive Shale Zones . . . Helps Increase Production 178 B/D

The decision to run a McCullough Radiation Well Log was worth $2,433.21 to this California operator. 390 shots would have been wasted in dry shales except for the discovery of a ten-foot error in electric log measurements.

Well had been bottomed at 11,237' and the electric log was run in open hole. A 5½" O.D., 23 lb. slotted liner was set through the productive interval. Well was put on production and slowly settled down to 22 barrels per day.

Operator decided to perforate liner to attempt to increase production. It was known that there were eight zones separated by shale beds to be perforated. A McCullough Radiation Well Log was run to exactly locate these zones and to check previous measurements. When correlated with the old electric log it was found that there had been a ten-foot error in depth measurement.



Exact measurement and definition of any potentially productive interval, thick or thin, assures "putting the shots where they count" for greater production — more oil!

The eight zones were perforated with a total of 1332 shots, four holes per foot, from the detailed data provided by the McCullough Log. 660 of these were ½" improved Ogival Bullets fired by 3⅜" O.D., McCullough M-3 guns, 2 holes per foot. The remaining 672 shots were fired by McCullough Standard Casing Glass Jets with Steel Strip Carriers, 2 holes per foot.

Production increased from 22 to 200 barrels of oil per day.

This job particularly emphasizes the extreme value of the accuracy and efficiency of the McCullough Radiation Well Log to the operator. Engineers of this company estimated that, had the well been shot by the old electric log measurements, 390 of the 1332 shots would have been placed in the non-productive shale beds separating the pay zones. At prevailing prices this would have meant a loss of $2,433.21 because of wasted shots. In addition the resulting production would have been considerably lower because of improper coverage of the eight zones.

It always pays to run a McCullough Radiation Well Log before perforating.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

LOS ANGELES
HOUSTON
EDMONTON

Cost Data

Footage price	$8.75
Day-work rate with drill pipe	$1,000.00
Day-work rate without drill pipe	$950.00

Normal Rig-Time Distribution

Days on footage rate	92
Days on day-work rate	33
Total days (spud to rig release)	125

Bit Data

Total number of bits	105
Feet per bit	125

Equipment

12,000-15,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells.
Nearest supply center: Odessa.
Terrain and roads: Flat; fair caliche roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	310	300
Intermediate	9⅝	4,700	1,900
Oil string	5½	13,000	435
Liner	7⅝	9,200	800

Mud Summary

Material—	Amount
Jel, tons	100
Lost-circulation material, tons	10
Soda ash, tons	2
Caustic soda, tons	4
Weighting material, tons	110
Quebracho, tons	3

Usual mud program: Water to 8,000; gel-oil to total depth.

Geological Data

Formation tops—	Depth (ft.)
San Andres	4,811
Spraberry	7,824
Strawn	9,900
Bend	10,178
Mississippi	11,198
Devonian	11,348
Silurian	12,183
Fusselman	12,293
Simpson	12,540
Ellenburger	12,952

GARZA FIELD
Garza County, Texas

Pay zone	San Andres
TD (avg.)	3,500 ft.

Cost Data

Footage price	$3.10
Day-work rate with drill pipe	$20.00

Normal Rig-Time Distribution

Days on footage rate	9
Days on day-work rate	7
Total days (spud to rig release)	16

Bit Data

Total number of bits	9
Feet per bit	400

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane.
Water supply: Hauling.
Nearest supply center: Post—6 miles.
Terrain and roads: Part very smooth. Rough by edge of cap rock.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	100 to 130	
Oil string	5½	3,500	300

Mud Summary

Material—	Amount
Gel, sacks	100
Starch, sacks	100

Usual mud program: Mud up for coring near the top of the pay zone.

Geological Data

Formation tops—	Depth (ft.)
Yates	1,500-1,600
San Andres	2,500-2,700
Glorieta	3,900

Remarks: No lost-circulation zones encountered except few in Glorieta section. Roads are all passable. In red bed section bits run 1,100 ft.; in lime (San Andres) bits average 125-175 ft.

HULLDALE FIELD
Schleicher County, Texas

Pay zone	Pennsylvanian reef lime
TD (avg.)	5,673 ft.

Cost Data

Footage price	$6.50
Day-work rate with drill pipe	$750.00
Day-work rate without drill pipe	$650.00

Normal Rig-Time Distribution

Days on footage rate	45
Days on day-work rate	10
Total days (spud to rig release)	55

Bit Data

Total number of bits	34
Feet per bit	167

Equipment

6,000-9,000-ft. class.
Usual fuel: Lease gas.
Water supply: Wells, ponds, hauling only in case of lost circulation.
Nearest supply center: San Angelo.
Terrain and roads: Terrain level; lease roads are caliche and oil; paved highway through field. Nearest rail shipping point, Eldorado, Tex.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	585	288
Oil string	5½	5,664	276

Mud Summary

Material—	Amount
Aquagel or bentonite, tons	40½
Mantan, lb.	990
Caustic soda, lb.	640
Soda ash, lb.	2,040
Fibertex, lb.	1,264
Jelflake, lb.	165
Lime, lb.	240
Cottonseed hulls, lb.	7,680
Mintox, lb.	100

Usual mud program: Loss of circulation usually near 1,940 ft. when encountered.

Geological Data

Formation tops—	Depth (ft.)
Top Permian	400
Palo Pinto limestone	5,300
Strawn reef limestone	5,450-5,640

HUNTLEY FIELD
Garza County, Texas

TD (avg.)	3,400 ft.

Cost Data

Footage price	$3.25
Day-work rate with drill pipe	$575.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	14
Days on day-work rate	5
Total days (spud to rig release)	19

Bit Data

Total number of bits	17
Feet per bit	220

Equipment

3,000-6,000-ft. class.
Water supply: Wells.
Terrain and roads: Dirt roads with caliche tops, partly rough country.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	7⅝	200	100
Oil string	5½ and 7	3,360	200

Mud Summary

Material—	Amount
Mylogel, sacks	139
Macogel, sacks	13
Salt gel, sacks	198
Lime, sack	1

Usual mud program: Water to 3,000 ft.; salt mud to total depth.

Geological Data

Formation tops—	Depth (ft.)
Anhydrite	1,264
Gates sand	1,667
San Andrew lime	2,732
Glorieta	3,895

JAMESON FIELD
Coke County, Texas

Pay zone	Strawn sands
TD (avg.)	6,200 ft.

Cost Data

Footage price	$5.30-$5.50
Day-work rate with drill pipe	$600-$650
Day-work rate without drill pipe	$550

Normal Rig-Time Distribution

Days on footage rate	26
Days on day-work rate	2
Total days (spud to rig release)	28

Bit Data

Total number of bits	33
Feet per bit	200

Equipment

6,000-9,000-ft. class.
Water supply: Wells and from the Colorado River.
Nearest supply center: San Angelo.
Terrain and roads: Sandy to very sandy in spots. Also low hills on south side of field.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	500	200
Oil string	5½	6,200	325

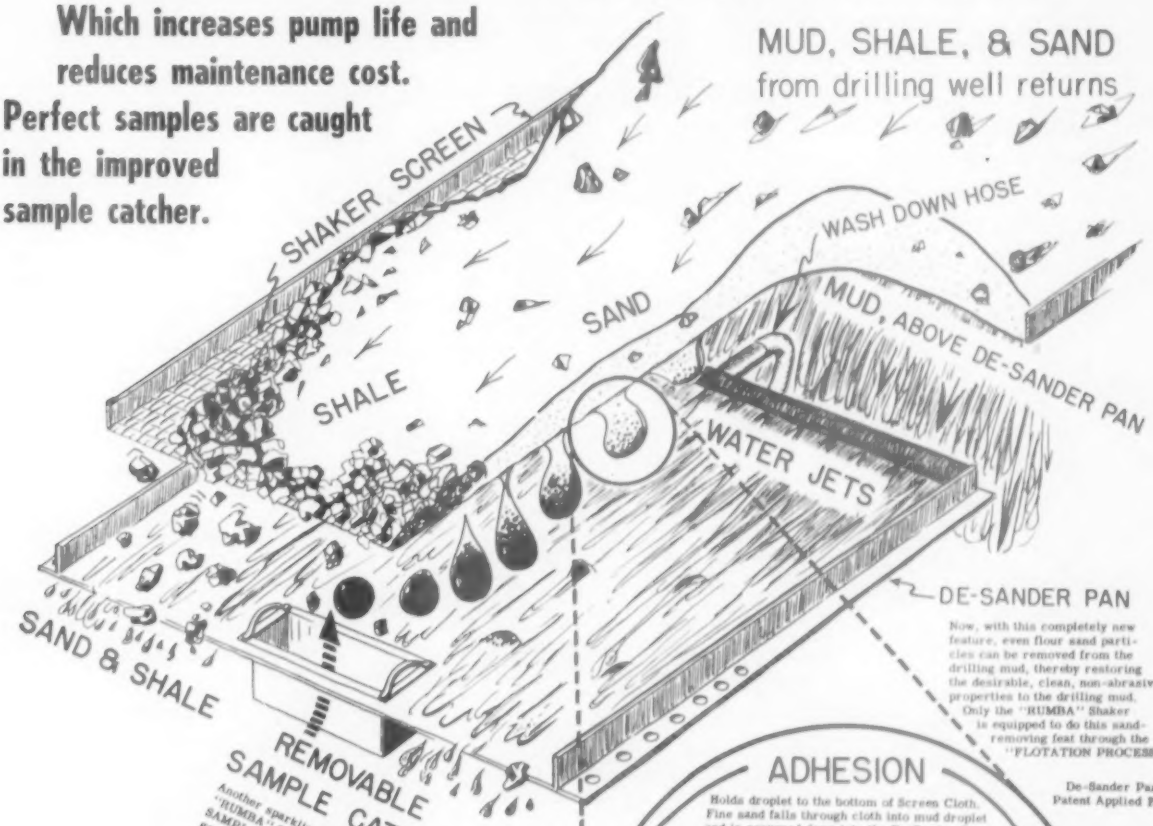
Mud Summary

Material—	Amount
Gel, lb.	37,000
Caustic, lb.	1,500
Driscose, lb.	450
Quebracho, lb.	3,000
Soda ash, lb.	3,800
Lime, lb.	300
Lubri-plastic, lb.	7,000

Usual mud program: Usual mud bill: $1,960.00. Spud mud from 0-500 ft.; clear

Successful contractors have learned . . . . You can de-sand your mud with the new "Rhumba" Shale Shaker and De-Sander

Which increases pump life and reduces maintenance cost. Perfect samples are caught in the improved sample catcher.



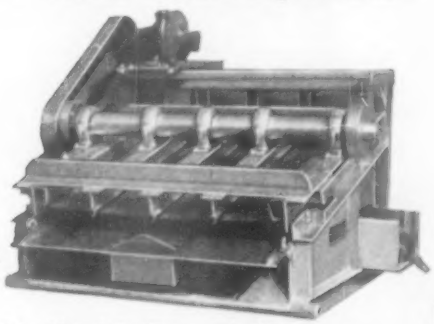
Now, with this completely new feature, even flour sand particles can be removed from the drilling mud, thereby restoring the desirable, clean, non-abrasive properties to the drilling mud. Only the "RUMBA" Shaker is equipped to do this sand-removing feat through the "FLOTATION PROCESS".

De-Sander Pan Patent Applied For

Another sparklingly new feature on the "RUMBA" Shaker is the built-in SAMPLE CATCHER which enables the geologist to obtain samples for analysis at intervals as desired.

ADHESION
Holds droplet to the bottom of Screen Cloth. Fine sand falls through cloth into mud droplet and is conveyed down into the De-Sander Pan.
SURFACE TENSION
SAND
Holds accumulated sand within droplet until weight causes it to drop into the De-Sander Pan

- ✓ Built-in De-Sander
- ✓ Sample Catcher
- ✓ New Mud By-Pass



It's New! It De-sands Mud and Saves Your Pumps! ! !

WRITE FOR 4860-B2 BULLETIN

HUTCHISON MANUFACTURING CO.

6609 AVE. U • HOUSTON, TEXAS

water from 500-5,000 ft. Gel from 5,000-5,500 ft. Gel, caustic and quebracho mud from 5,500 ft. to total depth.

Geological Data

Formation tops—	Depth (ft.)
Tubb zone	2,015
Coleman Junction	3,460
Base Cisco lime	4,440
Palo Pinto	5,560
Strawn	5,650
Reef	6,200

McELROY FIELD
Crane County, Texas

Pay zone	McElroy zone (Grayburg)
TD (avg.)	3,200 ft.

Cost Data

Footage price	$3.25
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	10
Days on day-work rate	2
Total days (spud to rig release)	12

Bit Data

Total number of bits	12
Feet per bit	250

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane.
Water supply: Wells.
Nearest supply center: Odessa.
Terrain and roads: Level; sandy brush country.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	500	350
Oil string	5½	2,900	*800

*Six per cent gel.

Usual mud program: Clear water to top of the lime at 2,900 ft.; salt gel, starch, and 12 per cent lease crude at top of lime to get mud up to 10.1 lb., 42 viscosity, and 2 cc. water loss.

Geological Data

Formation tops—	Depth (ft.)
Bustler anhydrite	950
Sandy Yates section	2,200
Grayburg lime	2,900
TD	3,100

Remarks: Drill to TD with rotary, run gamma ray-neutron, guard log. Run casing, knock out plug with cable tools; clean out, fracture down casing with 15,000 gal. oil and 30,000 lb. sand at 30 bbl. per minute. Selected wells are diamond cored through pay section. Approximately 200 ft. gross lime pay; net pay varies from 50 to 100 ft.

MIDLAND FARMS (ELLENBURGER) FIELD
Andrews County, Texas

Pay zone	Ellenburger
TD (avg.)	12,700 ft.

Cost Data

Footage price	$8.00
Day-work rate with drill pipe	$1,100.00
Day-work rate without drill pipe	$935.00

Normal Rig-Time Distribution

Days on footage rate	60
Days on day-work rate	5
Total days (spud to rig release)	65

Bit Data

Total number of bits	85
Feet per bit	150

Equipment

12,000-15,000-ft. class.
Usual fuel: Gas.
Water supply: Wells.
Nearest supply center: Odessa.
Terrain and roads: Flat, ranch land.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	250	300
Intermediate	9⅝	4,950	300
Oil string	5½	12,700	1,200

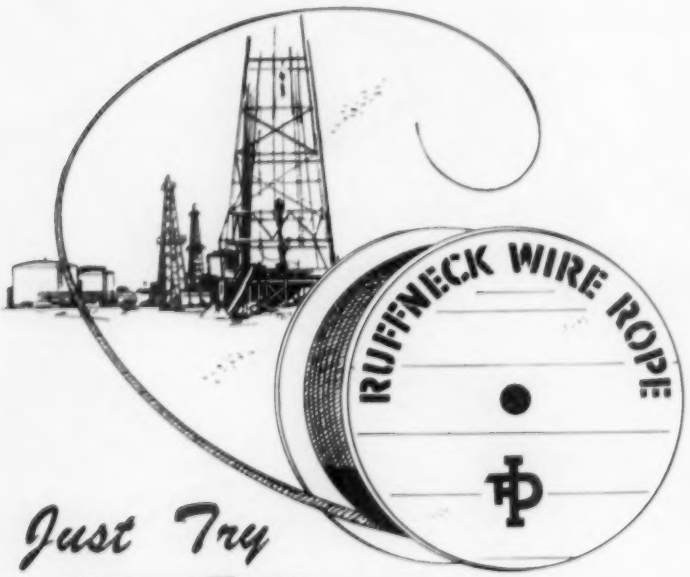
Mud Summary

Bentonite, sacks	800
Caustic soda, lb.	3,000
Quebracho, lb.	3,000
Soda ash, lb.	2,500
Other chemical, lb.	4,000

Usual mud program: Water (native mud) is used as drilling fluid except for a salt water-starch-oil emulsion from 4,600 to 5,000 ft. and gel-chemical oil-emulsion mud from 10,000 ft. to TD.

Geological Data

Formation tops—	Depth (ft.)
Grayburg	4,600
Clearfork	6,750
Wolfcamp	8,340
Pennsylvanian	9,690
Devonian	10,920
Montoya	12,000
Ellenburger	12,670



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RUFFNECK wire rope
It will prove itself!

Careful selection of the finest in steel and workmanship has produced in Ruffneck the strength and durability which consistently give more ton-miles of service . . . *plus* economy. And it's *pre*tested to meet *your* requirements.
Ruffneck is made by Kocks of Germany, leaders in the wire rope field, for Crispin, your guarantee of dependable service.
Expert manufacturing *does* make a difference in wire rope, an important money-saving difference. Try Ruffneck and see if you don't agree.

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NOLLEY FIELD
Andrews County, Texas

Pay zone	Wolfcamp
TD (avg.)	9,350 ft.

Cost Data

Footage price	$8.50
Day-work rate with drill pipe	$900.00
Day-work rate without drill pipe	$800.00

Normal Rig-Time Distribution

Days on footage rate	68
Days on day-work rate	14
Total days (spud to rig release)	85

Bit Data

Total number of bits	90
Feet per bit	100

Equipment

9,000-12,000-ft. class.
Usual fuel: Gas and butane.
Water supply: Wells.
Nearest supply center: Andrews or Odessa.
Terrain and roads: County roads, gravel.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	450	450
Intermediate	7⅝	4,850	1,900
Oil string	5½	9,350	500

Usual mud program: Clear water to 8,000 ft. Caustic-quebracho mud to TD with 10-15 per cent oil.

Geological Data

Formation tops—	Depth (ft.)
Queen sand	4,580
San Andres	5,100
Clearfork	7,400
Wichita Albany	8,100
Wolfcamp	9,015

NORTH RUSSELL (DEVONIAN) FIELD
Gaines County, Texas

Pay zone	Devonian
TD (avg.)	11,200 ft.

Cost Data

Footage price	$8.30
Day-work rate with drill pipe	$940.00
Day-work rate without drill pipe	$850.00

Normal Rig-Time Distribution

Days on footage rate	95
Days on day-work rate	5
Total days (spud to rig release)	100

Bit Data

Total number of bits	70
Feet per bit	160

Equipment

12,000-15,000-ft. class.
Usual fuel: Diesel.
Water supply: Wells, 500 ft. deep.
Nearest supply center: Hobbs, N. M. Approximately 25 miles.
Terrain and roads: Rolling, black top and dirt.

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	11¾	350	300
Intermediate	8⅝	4,600	(*)
Oil string	5½	11,200	(†)

*1,000 posmix, 800 6 per cent gel, and 200 neat. †535 posmix, 4 per cent gel, 200 neat.

Mud Summary

Material—	Amount
Gel, tons	30
Clay, tons	18
Loss circulation, lb.	2,500
Caustic, lb.	1,900
Starch, lb.	8,800
Soda ash, lb.	4,900
Antifoam, gal.	5
Dispersant, lb.	1,700
Sapp, lb.	450

Usual mud program: Oil emulsion to hold weight to 8 or 8.5 lb. per gal. as lost circulation is big problem.

Geological Data

Formation tops—	Depth (ft.)
Yates	2,908
San Andres	4,660
Glorieta	5,954
Clearfork	6,075
Wolfcamp	8,638
Mississippian	10,275
Woodford	10,793
Devonian	10,905

Remarks: Axis of Devonian structure lies NW-SE, but axis of Clearfork structure lies NE-SW.

PAROCHIAL-BADE FIELD
Sterling County, Texas

Pay zone	Clearfork
TD (avg.)	2,300-2,500 ft.

Here's why
Tube-Kote's
TK-2
PLASTIC
LININGS
are considered the most dependable and economical protection against corrosion and paraffin!

One of Tube-Kote's many specially-designed automatic spraying units which produce smooth, uniform coatings of TK-2 plastic.

TK-2 is Tube-Kote's exclusive plastic . . . developed in Tube-Kote laboratories . . . made in Tube-Kote's own compounding department . . . applied and baked by Tube-Kote's specially designed equipment—all under the direct supervision of Tube-Kote chemists and engineers. Their special equipment permits proper pre-conditioning of metal surface . . . assures uniform application of plastics . . . affords an accurate control of baking temperatures.

Another guarantee of high quality is Tube-Kote's 16 years of experience in the development of plastics for lining oil field equipment. They **know** the problems involved in combating corrosion and paraffin, and they understand the characteristics and properties plastic linings must have to solve these problems. Their TK-2 has proved so superior it has been applied to more than 12,000,000 feet of oil field pipe!

Pioneers of plastic linings for oil field equipment since 1939.
Manufacturers-extruders of plastic pipe for the oil industry.

Write for New 1956 Bulletin on TK-2 Plastic Linings.

Factory-trained field engineers available for consultation in all principal oil areas.

TUBE-KOTE
TUBE-KOTE, INC.
P. O. Box 20037 - Houston 25, Texas

Cost Data

Footage price	$4.00
Day-work rate with drill pipe	$528.00
Day-work rate without drill pipe	$480.00
Cable tools	$240.00

Normal Rig-Time Distribution

Days on footage rate, rotary	10
Days on day-work rate, rotary	4
Days using cable tools	4
Total days (spud to rig release)	18

Bit Data

Total number of bits	7
Feet per bit	350

Equipment

Cable tools or combination cable tools and rotary.
Usual fuel: Butane.
Water supply: Wells, 250 ft. deep.
Nearest supply center: Big Spring.
Terrain and roads: Rough and rolling hills.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	300	100
Oil string	5½	2,230	275

Mud Summary

Salt-water gel from 300 to 2,230 ft. Approximately $500 worth.

Formation tops—	Depth (ft.)
Average elevation	2,550
Queen	1,050
San Andres	1,650
Glorieta	2,180
Clearfork	2,230
Total depth	2,240

PRENTICE FIELD
Yoakum and Terry Counties, Texas

Pay zone	Glorieta (Permian)
TD (avg.)	6,000 ft.

Cost Data

Footage price	$5.25
Day-work rate with drill pipe	$725.00
Day-work rate without drill pipe	$650.00

Normal Rig-Time Distribution

Days on footage rate	20
Days on day-work rate	3
Total days (spud to rig release)	23

Bit Data

Total number of bits	20
Feet per bit	300

Equipment

6,000-9,000-ft. class.
Usual fuel: Diesel.
Water supply: Wells.
Nearest supply center: Brownfield, 30 miles.
Terrain and roads: Terrain, level; roads, good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	2,500	1,000
Oil string	7	6,000	1,200

Mud Summary

Material—	Amount
Salt, sacks	1,000
Salt gel, sacks	150
Starch, sacks	50

Usual mud program: Saturated salt water to 5,500 ft. Low water loss salt-water-base mud below 5,500 ft.

Geological Data

Formation tops—	Depth (ft.)
Tertiary sand and shale	Surface
Permian	250
Rustler	2,500
Salado	2,600
San Andres dense dolomite	4,300
San Andres porous dolomite	5,200
Glorieta	5,900

Remarks: No unusual drilling problems. Occasional loss of returns while drilling with salt water through porous San Andres dolomite from 5,200 to 5,900 ft. Jet bits used practically 100 per cent.

PUCKETT FIELD
Pecos County, Texas

Pay zone	Ellenburger
TD (avg.)	14,140 ft.

Cost Data

Footage price	$13.00
Day-work rate with drill pipe	$1,150.00
Day-work rate without drill pipe	$1,050.00

Normal Rig-Time Distribution

Days on footage rate	90
Days on day-work rate	85
Total days (spud to rig release)	175

RIG VIBRATION
IS VERY
COSTLY

Eliminate This Beating with the
"BIG HOLE"
FLUIDRILL

Both your rig and pocket book take a terrific beating while drilling the intermediate hole from surface to about 5000 feet. Downtime due to fishing jobs, drill pipe and drill collar failure, wear on wire lines, replacement of derrick bolts, and repairs to floor equipment caused by vibrations transmitted from a conventional drill string are very costly.

The 12¼" "Big Hole" Fluidrill has eliminated conservatively 90% of these detrimental vibrations. You can readily see what this means in rig maintenance savings — it runs into a high figure.

The Fluidrill enters the string like a drill collar subbing directly to the bit. Utilizing the mud pressure and a 2½' stroke telescoping barrel, the Fluidrill maintains a constant pressure on the bit and keeps it firmly seated and working at all times.

Like the regular Fluidrills which increase penetration rates 25% or more in deep hard formation drilling, the "Big Hole" Fluidrill is available on a rental basis.

Write or call for complete information!

DIRECTO CORPORATION

● Plant: 2417 Bissonnet Street, Houston, Texas, Telephone JAckson 8-2904
● Field Office: P. O. Box 366, Midland, Texas, Telephone 2-4247

FLUIDRILL
TOPS ON BOTTOM

Bit Data

Total number of bits	127
Feet per bit	116

Equipment

12,000-15,000-ft. class.
Usual fuel: Gas.
Water supply: Wells.
Nearest supply center: McCamey.
Terrain and roads: Rolling hills; all-weather roads, mostly black top.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	1,025	900
Intermediate	8⅝	7,120	2,300
Oil string	5½	13,420	1,600

Mud Summary

Material—	Amount
Barite, sacks	6,150
Bentonite, sacks	2,775
Driscose, lb.	6,900
Caustic soda, lb.	34,500
Tannin, lb.	18,200
Soda ash, lb.	30,000
Bicarbonate of soda, lb.	5,300
Barium carbonate, lb.	5,800
Lime, lb.	9,500
Cottonseed hulls, lb.	98,300

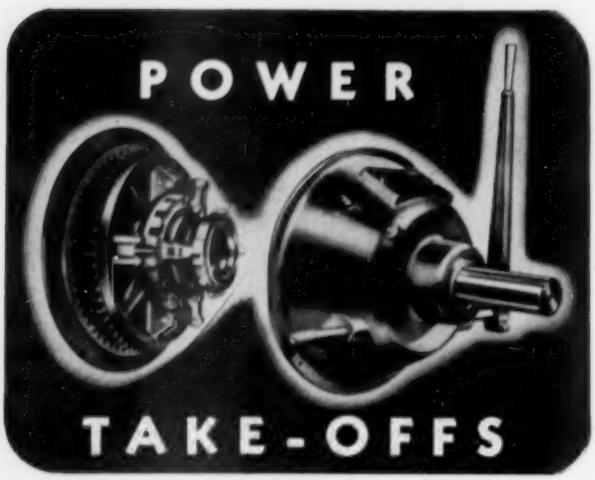
Usual mud program: Raise viscosity to set 13⅜-in. casing; mud up with bentonite and chemical treatment to set 8⅝-in. Mud up at 10,500 ft. with Driscose, caustic and tannin to total depth. Average mud properties below 10,500 ft.: weight 11.3, viscosity 50, gels 0-5, water loss 6 cc., cake 2/32 in.

Geological Data

Formation tops—	Depth (ft.)
Base Cretaceous—Top Permian	800
Wolfcamp	5,100
Devonian	11,900
Fusselman	12,500
Simpson	12,800
Ellenburger	13,200
Granite	14,900

Remarks: Contracts are for drilling on a footage basis to 11,000 ft. or top of the Devonian chert whichever was reached first, then daytime drilling.

ROCKFORD



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SELF CONTAINED UNIT
WIDE RANGE OF SIZES
CONSERVATIVE RATING
ROLLER BEARINGS
FINE ADJUSTMENT
ACCURATE BALANCE
S.A.E. DIMENSIONS

* Fine adjustments of ROCKFORD POWER TAKE-OFFS are maintained by simple, positive locking means, located near the outer diameter of the clutch.
* The lock is readily accessible, through a hand-hole in the bell housing or cover.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 1305 18th. Avenue, Rockford, Illinois, U.S.A. ▲

CLUTCHES

Texas Panhandle

HITCHLAND FIELD
Hansford County, Texas Panhandle

Pay zone	Cisco limestone
TD (avg.)	4,621 ft.

Cost Data

Footage price	$4.20
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	15.0
Days on day-work rate	1.3
Total days (spud to rig release)	16.3
Days with completion rig	6.3

Bit Data

Total number of bits	15.5
Feet per bit	298

Equipment

3,000-6,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells.
Nearest supply center: Borger, Tex.
Terrain and roads: Prairie and creek valley. Hard-surfaced road to field from Highway 282.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	7⅝ or 8⅝	1,710	715
Oil string	4½ or 5½	4,600	163

Mud Summary

Material—	Amount
Caustic soda, lb.	660
Soda ash, lb.	5,670
Mantan, lb.	1,310
Aquagel, lb.	36,300
Cottonseed hulls, lb.	12,500
Fibertex, lb.	3,000
Diesel fuel, gal.	1,600

Usual mud program: Small amount of Aquagel to drill surface hole. Water only below surface casing to 2,800 ft., where hole was mudded up.

Geological Data

Formation tops—	Depth (ft.)
Glorieta sand	1,000
Brown dolomite	2,800
Cisco limestone	4,550

WEST PANHANDLE OIL FIELD
Texas Panhandle

Pay zone	Brown dolomite
TD (avg.)	3,050 ft.

Cost Data

Footage price	$3.00
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	8
Days on day-work rate	½
Total days (spud to rig release)	9

Bit Data

Total number of bits	7
Feet per bit	430

Equipment

3,000-6,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells or hauling.
Nearest supply center: 15 miles.
Terrain and roads: Flat and fair to good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	550	150
Oil string	5½	3,050	100

Mud Summary

Material—	Amount
Bentonite, sacks	50
Hulls, sacks	20
Oil, bbl.	50

Usual mud program: Natural mud to 2,660 ft.; mix bentonite mud; add hulls and oil.

Geological Data

Formation tops—	Depth (ft.)
Brown dolomite	2,775
Moore County limestone	3,050

North Texas

ARIES FIELD
Montague County, Texas

Pay zone	Caddo lime
TD (avg.)	6,230 ft.
Top pay (Caddo) (avg.)	6,071 ft.

Cost Data

Footage price	$4.00
Day-work rate with drill pipe	$550.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	18
Days on day-work rate	2
Total days (spud to rig release)	23

Bit Data

Total number of bits	17
Feet per bit	370

Equipment

6,000-9,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells.
Nearest supply center: Bowie, Tex.
Terrain and roads: Rolling, sandy, clay terrain dissected by intermittent streams. Roads dirt, very poor in wet weather.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	485	275
Oil string	5½	6,210	250

Material—	Amount
Bentonite, lb.	45,000
Quebracho or causticized lignite, lb.	1,600
Caustic soda, lb.	1,500

Usual mud program: No lost circulation problems in area. Make up water 0-300 p.p.m. salt content. Average total mud cost: $1,400.00 per well. Approximately 10 per cent crude oil added to mud without emulsifying agent.

Geological Data

Formation tops—	Depth (ft.)
Davenport limestone	1,942
Bryson sand zone	4,081
Denton Creek (Strawn) sand zone	5,382
Caddo (Richardson) limestone	6,060
Conglomerate (Bend)	6,135
Marble Falls limestone (Morrow)	6,220
Viola limestone	7,050
Simpson limestone	7,360

Remarks: Operators set casing through pay and usually give acid treatment of at least 500 gal.

BIG MINERAL FIELD
Grayson County, Texas

Pay zone	Five different zones
TD (avg.)	6,000 ft.

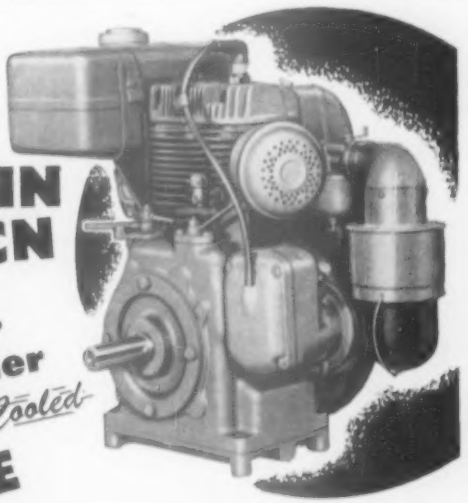
Normal Rig-Time Distribution

Days on footage rate	18
Days on day-work rate	1
Total days (spud to rig release)	19

Bit Data

Total number of bits	34
Feet per bit	180

This is the NEW WISCONSIN Model ACN 5½ H.P. Single Cylinder HEAVY-DUTY Air-Cooled ENGINE



Here is a new, light weight engine, designed and built to Wisconsin heavy-duty standards in all details, offering original equipment builders and engine users maximum power advantage and performance in a 2.3 to 5.6 hp. range at 1600 to 3600 rpm.

Like all Wisconsin Engines, the Model ACN has the built-in Lugging Power that hangs on through the shock load pinches and keeps the job moving without stalling. With a 2⅝" bore x 2¾" stroke, it has a 14.88 cu. in. displacement.

Heavy-duty features include tapered roller main bearings at BOTH ends of the crankshaft; rotary type high tension OUTSIDE Magneto with Impulse Coupling for quick, all-weather starts at low cranking speed; pump-circulated splash lubrication plus efficient AIR-COOLING from extreme sub-zero to 140° F.

Perhaps this is just the power component you have been looking for — *power to fit the machine; power to fit the job.* Write for Bulletin S-179.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
2430 McKINNEY AVENUE • HOUSTON, TEXAS
505 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

Equipment

6,000-9,000-ft. class.
3,000-6,000-ft. class.
Usual fuel: Gas.
Water supply: Lake Texoma.
Nearest supply center: 12 miles.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	400	200
Oil string	5½	6,000	1,400

Mud Summary

Down to 3,000 ft.—driller's discretion; 3,000 ft. to TD—15 per cent crude oil or diesel oil emulsion.

Geological Data

Formation tops—	Depth (ft.)
Little sand	3,700
Barnes sand	5,400
"S" sand	5,900
"U" sand	6,400
"V" sand	7,200'

HERR-KING FIELD
Callahan County, Texas

Pay zone	Moran
TD (avg.)	2,600 ft.

Cost Data

Footage price	$2.75
Day-work rate with drill pipe	$550.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	5
Days on day-work rate	3
Total days (spud to rig release)	8

Bit Data

Total number of bits	6
Feet per bit	425

Equipment

3,000-4,000-ft. class.
Usual fuel: Butane.
Water supply: Hauling.
Nearest supply center: Abilene.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	90	125
Oil string	5½	2,700	125

Mud Summary

Usual mud bill: $300.00.

Geological Data

Formation tops—	Depth (ft.)
Base of Palo Pinto	2,470
Top of Crosscut	2,450

NOODLE FIELD
Jones County, Texas

Pay zone	Canyon Reef, Canyon sands
TD (avg.)	4,700 ft.

Cost Data

Footage price	$3.50
Day-work rate with drill pipe	$600.00
Day-work rate without drill pipe	$480.00

Normal Rig-Time Distribution

Days on footage rate	15
Days on day-work rate	2
Total days (spud to rig release)	17

Bit Data

Total number of bits	15
Feet per bit	315

Equipment

3,000-6,000-ft. class.
Usual fuel: Gas or butane.
Water supply: Ponds.
Nearest supply center: Abilene.
Terrain and roads: Level, fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	160	75
Oil string	5½	4,700	200

Geological Data

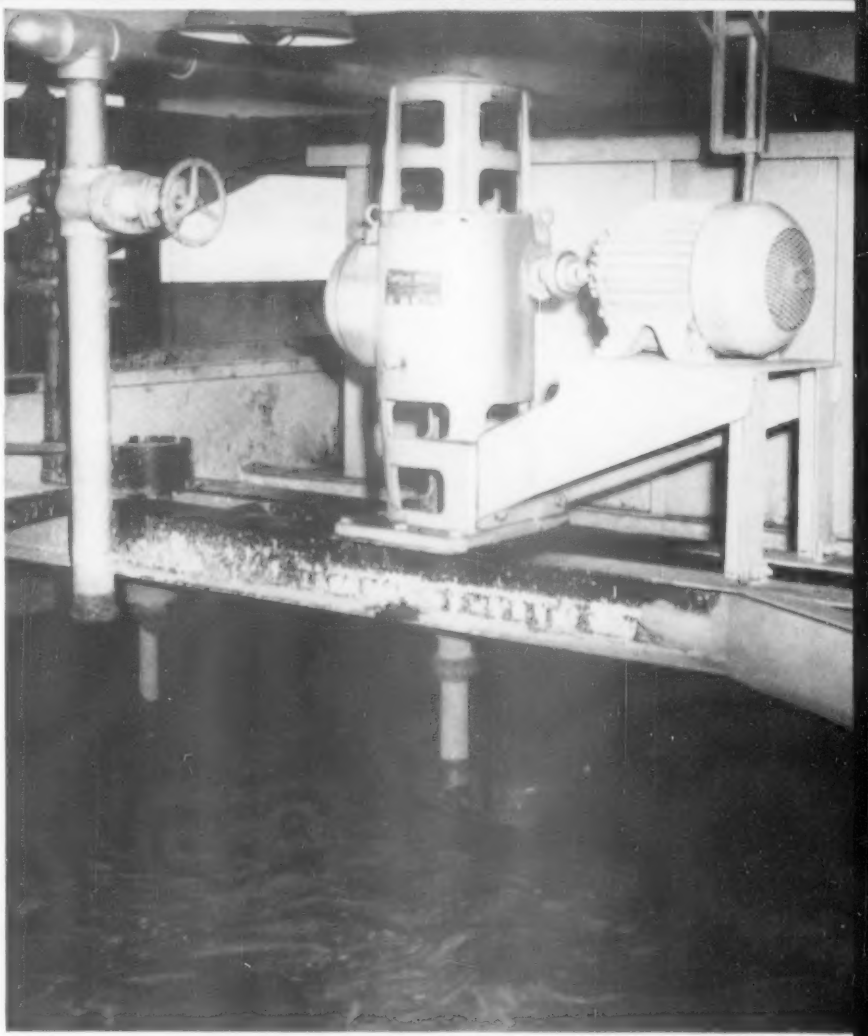
Formation tops—	Depth (ft.)
Noodle Creek limestone	709
Saddle Creek	917
Flippen	
Swastika sand	1,371
Canyon sands	2,270
Palo Pinto	2,855

SHERMAN AREA FIELD
Grayson County, Texas

Pay zone	Oil Creek
TD (avg.)	10,500 ft.

small
investment
saves
BIG
engine
repair bills
Lube oil failure and overheated cooling water can lead to BIG troubles *unless you spot them quickly.* That's just what a Penn Engine Safety Control does. At the first sign of such troubles, this control automatically flashes a warning light, sounds an alarm bell, or stops the engine — whichever you choose. Then, the fault can be investigated and corrected before engine damage develops. This low cost insurance for expensive equipment can be easily installed on present engines, and is available from your manufacturer on new models. Ask your engine supplier or write **Penn Controls, Inc., Goshen, Indiana.**
PENN
AUTOMATIC CONTROLS
FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

Why the mud's **always good** *off the Gulf Coast*



There's a powerful difference between ordinary drilling mud and this mud you're looking at, in the tank of an LST drilling barge off Galveston Bay.

This mud has waves in it.

And under the waves, where it counts, this mud flows and interchanges constantly. A strong, steady flow sweeps every corner of the tank—keeping *all* the mud equalized, *all* of it ready for immediate use down the hole.

Mud can't settle out; so less mud is used. The mud bill is much lower than when mud is mixed the old way.

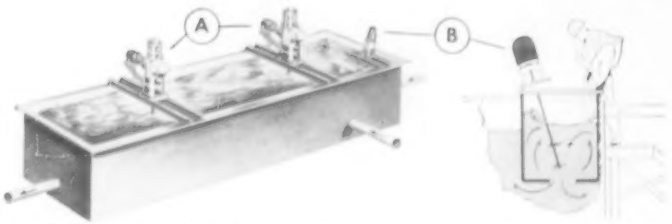
Heavier or thicker mud—in seconds—Every gallon of mud in this system is the same weight and viscosity. And you can *change* mud weight and viscosity, as much or as little as you want, literally *in seconds.*

In an emergency, you can feed-in weight and gel additions by the whole sackful—one sackful right after another. There's no clogging, no waiting. *Immediately*, the whole system shows a uniform weight rise. Within a few minutes, weight and viscosity are completely equalized.

You get this always-flowing, top-condition mud with LIGHTNIN Mixers. First, a high-speed LIGHTNIN Flash Mixer wets and feeds ingredients to the flowing mud—as fast as you can dump them in. Meanwhile, the big LIGHTNIN Mud Mixer you see here distributes the materials evenly—keeps mud fluid and ready to go to work.

Make savings like these—You actually *save* on power, because you need not use a standby pump for tank circulation. The LIGHTNINS do the work, on about *one-tenth* of the usual pump horsepower.

You cut maintenance cost, too. There are no pump parts, valves, or fittings being chewed up in mud agitation service. The only parts that touch mud are the LIGHTNIN Mixer shaft and impeller—easily replaced at any time, for as little as *one-third* your present upkeep cost.



KEEP MUD IN TOP SHAPE with this simple system. One or two LIGHTNIN Mud Mixers (A) have rotating turbines that keep mud flowing, equalize it quickly. Mud weight and viscosity change almost instantly when weight and gel ingredients are added through LIGHTNIN Flash Mixer (B) in open-bottom well.

These are some of the reasons why LIGHTNIN mud control is fast becoming "standard" on offshore drilling barges. Independent drilling men and oil companies are getting better mud—for less money—with LIGHTNINS in many land tanks and earthen pits, too.

Doesn't this make you feel that LIGHTNINS for *your* mud mixing are worth a closer look? Here's how to get the facts, firsthand. Ask your LIGHTNIN sales engineer to arrange a field trip to a barge or land rig in your area so you can see LIGHTNINS at work.

You'll find his name listed in Composite Catalog—or just write, wire, or phone us direct.

SEND FOR this free 6-minute picture story. It shows how you get instant mud control and cut costs, too, with LIGHTNIN Mud Mixers.

MIXING EQUIPMENT Co., Inc., 174-j Mt. Read Blvd., Rochester 11, N. Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 10, Ont.

"Lightnin Mixers"

WELCOME DELEGATES

HOUSTON, TEXAS
SEPTEMBER 26 - 28
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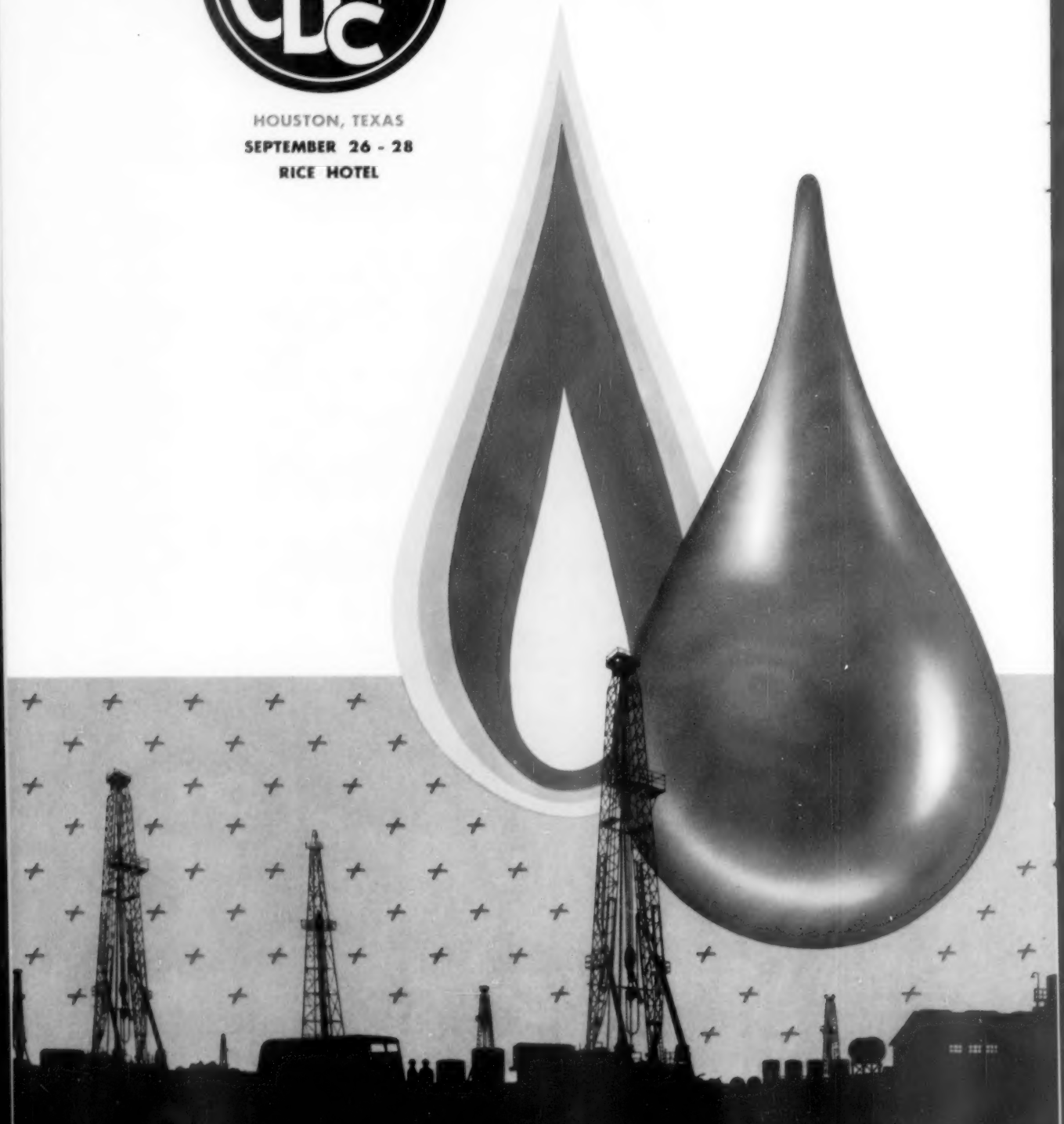

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PACIFIC PUMPS, INC., Huntington Park, Calif. — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind. — Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, and positive displacement meters.

IDECO

IDECO, Dallas, Tex. — Hydrair and Power Rigs; Full-View Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud Pumps; Petroleum Equipment and Supplies.

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MAGNET COVE BARIUM CORP., Houston, Tex.; Malvern, Ark. — Magcobar and Magrogel drilling muds and other specialized oil well drilling fluids and chemicals.

LANE WELLS

LANE-WELLS CO., Los Angeles, Calif.; Houston, Tex.; Oklahoma City, Okla. — Electric and Radioactivity Well Logging; Koneshot perforating and bullet perforating; packers and bridging plugs.

Security

SECURITY ENGINEERING DIVISION, Dallas, Tex.; Whittier, Calif. — Rock bits, hole openers, reamer rock bits, reamers, casing scrapers, Securalov.

DRESSER IDECO

DRESSER IDECO DIVISION, Columbus, Ohio — Radio and television broadcasting towers, steel buildings, aircraft hangars, mechanical parking garages, electric power substations.

CLARK

CLARK BROS. CO. DIVISION, Olean, New York — Engines and reciprocating, centrifugal, and axialflow compressors — gas, steam, electric and diesel driven.

DRESSER MANUFACTURING DIVISION

DRESSER MANUFACTURING DIVISION, Bradford, Pa. — Pipe line couplings, pipe repair sleeves and clamps, weldments and forgings, welding fittings, flanges, rings.

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Dresser pays tribute to the many achievements of the great oil, gas and chemical industries . . . achievements that call for increasingly high standards in field and plant equipment and services. Always striving to pace these exacting demands, Dresser constantly amplifies the Dresser Plus+ wherever and whenever possible. No other single company provides the same broad range of superior products and services. Dresser equipment and services are the standard of comparison . . . the world over!

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Your well surveying worries are over when you put a Sperry-Sun E-C Inclinometer on the job. Here, in one simple, convenient package is everything necessary to insure quick, positive, accurate, easily read and permanent records at any depth. For instance:

E-C provides multiple records in a single round trip...
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Lafayette, Kenner, La. • Casper, Wyo.

Cost Data

Footage price	$7 to 8,000 ft.; $9 to 10,000 ft.
Day-work rate with drill pipe	Add 1½ ft. per day to price below
Day-work rate without drill pipe	$800-$1,000

Normal Rig-Time Distribution

Days on footage rate	42 to 8,000
Days on day-work rate	63
Total days (spud to rig release)	105

Bit Data

Total number of bits	95-120
Feet per bit	40-50 below 8,000 ft.

Equipment

9,000-12,000-ft. class.
Water supply: Wells or hauling.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝ or 10¾	2,000-3,000	600-750
Oil string	5½ or 7	10,200-10,600	750-850

Usual mud program: Varies widely depending on company or operator and mud company used.

Geological Data

Formation tops—	Depth (ft.)
Base Trinity—top Strawn or Deese	2,400-2,600
Top Dornick Hills	6,700-7,300
Top Baker sand zone	7,000-7,600
Top Davis sand zone	7,700-8,100
Top Cordell sand zone	8,500-8,900
Top Simpson sand zone	8,700-9,500
Top Oil Creek sand (on main structure)	9,700-10,900

Texas Gulf Coast

CHOCOLATE BAYOU
Brazoria County, Texas

Pay zone	Houston Farms
TD (avg.)	10,200 ft.

Cost Data

Footage price	$3.75
Day-work rate with drill pipe	$935.00
Day-work rate without drill pipe	$770.00

Normal Rig-Time Distribution

Days on footage rate	25
Days on day-work rate	20
Total days (spud to rig release)	45

Bit Data

Total number of bits	28
Feet per bit	365

Equipment

Steam rigs: 9,000-12,000-ft. class.
Usual fuel: Gas.
Water supply: Water wells.
Nearest supply center: Alvin.
Terrain and roads: Paved to lease and shell to location.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	200	150
Intermediate	9⅝	2,650	800
Oil string	5½	10,200	500

Mud Summary

Material—	Amount
Weight material, sacks	600
Gel, sacks	10
Caustic, lb.	6,000
Quebracho, lb.	16,000
Lime, lb.	3,500
Clay, lb.	3,600
Mica, lb.	7,700

Usual mud program: Natural-gel to 6,500 ft.; red to 9,200 ft. and lime to total depth.

Geological Data

Formation tops—	Depth (ft.)
First Frio	8,800
Allibel	9,350
Upper Houston Farms	9,840
Lower Houston Farms	10,140

Southwest Texas

CROWN EAST FIELD
Atascosa County, Texas

Pay zone	Navarro sand
TD (avg.)	4,350 ft.

Cost Data

Footage price	$2.20
Hourly rate with drill pipe	$21.00

Normal Rig-Time Distribution

Days on footage rate	5
Days on day-work rate	4
Total days (spud to rig release)	9

NEW WILLIAMS LOCKING ADJUSTABLE WRENCH

THE ONLY REAL ADJUSTABLE WRENCH IMPROVEMENT IN OVER 40 YEARS!

WITH FEATURES YOU HAVE ALWAYS WANTED IN AN ADJUSTABLE WRENCH

- No Obstructions
- Structurally Sound
- Positive Lock
- Rapid Adjustment
- One Hand Operation
- No Fumbling
- Drop-Forged from Selected Alloy steel and Chrome Plated

AVAILABLE AT NO EXTRA COST

No.	Size	Capacity	List Price
8L	8"	15/16	$2.45
10L	10"	1⅛	$3.10
12L	12"	1⅜	$4.50

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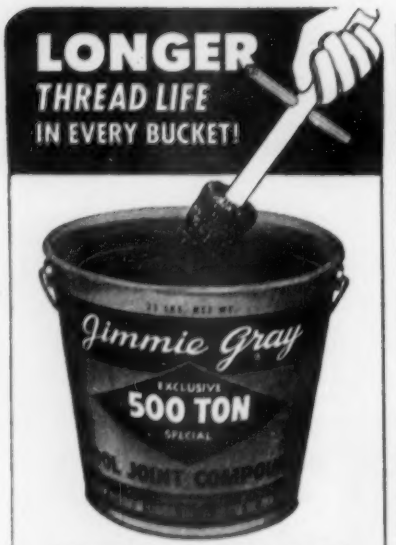

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Quality Oil Field Lubricants Available in LA. - MISS. - TEX. - N.M. - N.D. - WYO.

Bit Data

Total number of bits	1
Feet per bit	1,000

Equipment

3,000-6,000-ft. class.
Usual fuel: Kerosine.
Water supply: 350-ft. water wells.
Nearest supply center: San Antonio.
Terrain and roads: Fairly flat and level-dirt roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	106	75
Oil string	5½	4,331	275

Mud Summary

Material—	Amount
Aquagel (approx. sacks)	100
Baroid, sacks	30

Water loss material as needed.

Geological Data

Formation tops—	Depth (ft.)
Sparta	600
Carrizo	1,040
Wilcox sand	1,500
Navarro sand	4,300

LULING-BRANYON FIELD
Caldwell County, Texas

Pay zone	Austin chalk
TD (avg.)	2,600 ft.

Cost Data

Footage price	$2.40
Day-work rate with drill pipe	$500.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	3
Days on day-work rate	2
Total days (spud to rig release)	6

Bit Data

Total number of bits	1
Feet per bit	2,600

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane.
Water supply: Wells.
Nearest supply center: 7 miles.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	50	40
Oil string	5½	2,600	500

Mud Summary

Material—	Amount
Gel, sacks	25

Geological Data

Formation tops—	Depth (ft.)
Austin chalk	2,250
Eagle Ford shale	2,525
Buda lime	2,550

East Texas

LONGWOOD FIELD
Harrison County, Texas

Pay zone	Goodland lime
TD (avg.)	2,400 ft.

Cost Data

Footage price	$2.00
Day work rate with drill pipe	$15.00

SAVE TIME, SAVE MONEY
Specify
PRECISION

All your laboratory needs can be taken care of quickly, at lowest cost when you buy Precision equipment. Over 1500 items are available from Precision to meet your every requirement.

And you can be sure of long, dependable service from Precision equipment because *we make the items we sell*. Quality control in our factory plus Precision manufacturing efficiency assure you of top performance. Write us for descriptive bulletins.

IMMEDIATE DELIVERY ON THESE ITEMS:

Hi-Speed Centrifuge

Rheostat controlled speeds 1800-5000 rpm suitable for micro and semi-micro analysis, and difficult chemical separations. Holds eight 15 ml straight or tapered tubes. Adapters for ½ to 5 ml tubes. Data sheet 204.

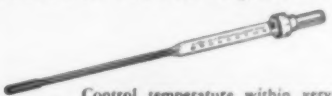
Heaters and Hot Plates

Built specifically for lab service. High quality porcelain refractory tops. Provisions for apparatus set-ups on heaters. Two adjustable heat types: Ful-Kontrol with autotransformer control from 0 to 750 watts and Type RH with built-in rheostat. Catalog 600.

Mag-Mix Stirrers

Magnetically agitate liquids under pressure, in vacuum. Mix viscous liquids. Stir batches of test tubes simultaneously. Rheostat controlled speed ranges. Two electric models, one air model for safe use with flammable liquids. Bulletins 590-R and 595.

Micro-Set Thermo-Regulators



Control temperature within very narrow limits (models as sensitive as ±0.005°F). Operate electrical relay which controls heating elements, etc. Temperature setting may be pre-set or changed. Range spans as wide as —35° to +500°F. Bulletin 647A.

Precision Scientific Company

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Yes! but--

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Creates Even More Vital Savings

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Send for your copy of the 8-page catalog, detailing advantages, operation features, principles of operation, design, construction and installation.

But of major interest to the petroleum industry are the facts that:

1. $60 per 10,000 barrels of finished gasoline can be saved through a gain of only 0.1 lb. in R.V.P.
2. The present average gain produced by Automatic Reid is over 0.2 lb.!

This thoroughly tested instrument—licensed by Standard Oil Company (Indiana) and manufactured exclusively by Precision Scientific Company—can make the following possible in your plant:

1. Maximum butane utilization.
2. Reduced ethylization costs.
3. Slashed blending requirements.
4. Safe, dependable in-line blending operation.

Accurate Reading — 3 Minutes

The meaningful potentials of the Automatic Reid are based on its ability to monitor as you blend and to give **an accurate reading of minor R.V.P. changes in only 3 minutes**—as compared with the less dependable readings given by the manual ASTM D 323 method **after a 4-hour stirring period!** Any change to higher or lower Reid material is noted during the blending operation IN TIME TO CORRECT THE BLEND. Trimming operations are easily accomplished.

Economy — Insurance — Better Product

The Automatic Reid is practical for in-line blending. It gives a surety to batch blending—avoids the costly handling of product holdovers. Best of all, a better finished gasoline is produced while great savings are being made.

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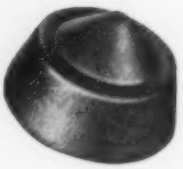
BIT LEGS | BIT CONES

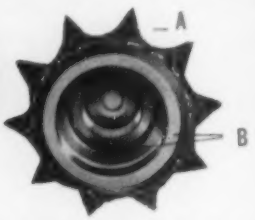
DROP FORGINGS

High nickel-moly alloy steel with controlled grain-flow for longest life.



FINISHED PARTS

A Balanced bearing design and B accurate machining for precision assembly.

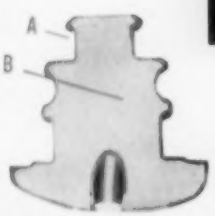


A Correct heel design and hard facing B Bearing races precision ground.

BALLS & ROLLERS

Special tool steel alloy, heat-treated for maximum wear, and precision ground all over.

SECTIONS



Horizontal section of Leg Journal shows
A hard case for long wear
B tough, ductile core which gives strength and shock resistance.

Cone section shows careful balance between
A bearing size
B shell thickness
C tooth depth

Step by step these parts show why

You can't buy a better bit than an HCSmith ROCK BIT

-every bit as good as the best

HCSmith OIL TOOL CO.

GENERAL OFFICES, EXPORT OFFICES AND PLANT: COMPTON, CALIF.

BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA

Normal Rig-Time Distribution

Days on footage rate	5
Days on day-work rate	2
Total days (spud to rig release)	7

Bit Data

Total number of bits	2
Feet per bit	1,200

Equipment

3,000-6,000-ft. class.

Usual fuel bill: $400.00.
Water supply: Ponds.
Nearest supply center: Shreveport, 15 miles.
Terrain and roads: Deep sand and rough going.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	100	100
Oil string	5½ or 7	2,400	100

Geological Data

Formation tops—	Depth (ft.)
Goodland lime	2,400

Remarks: The lime is either acidized or fractured prior to completion.

NECHES FIELD
Anderson and Cherokee Counties, Texas

Pay zone	Woodbine and/or Sub-Clarksville
TD (avg.)	4,800 ft.

Cost Data

Footage price	$2.20
Day-work rate with drill pipe	$550.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	9.7
Days on day-work rate	3.0
Total days (spud to rig release)	12.7

Bit Data

Total number of bits	4
Feet per bit	1,050

Equipment

3,000-6,000-ft. class.
Usual fuel: Natural gas.
Water supply: Neches River.
Nearest supply center: Palestine, Tex.
Terrain and roads: Heavily timbered rolling bottom; iron-ore roads constructed for locations and batteries.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	500	175 w/ 8% gel
Oil string	5½	4,750	225 w/ 12% gel

(400 sacks w/ 8% gel staged with tool set at 1,900 ft.)

Usual mud program: Small amounts of caustic, quebracho, gel, and lime are used for low pH red mud with average mud weight 10 lb. per gallon, 40 to 45 viscosity, minimum water loss 10 cc.

Geological Data

Formation tops—	Depth (ft.)
Eagle Ford (Sub-Clarksville)	4,550
Woodbine	4,700

South Louisiana

CHURCH POINT FIELD
Acadia Parish, Louisiana

Pay zone	Oligocene (Nodosaria blanpiedi)
TD (avg.)	12,500 ft.

Cost Data

Footage price	$3.75-$4.50
Day-work rate with drill pipe	$825-$933
Day-work rate without drill pipe	$725-$866

Normal Rig-Time Distribution

Days on footage rate	35
Days on day-work rate	57
Total days (spud to rig release)	92

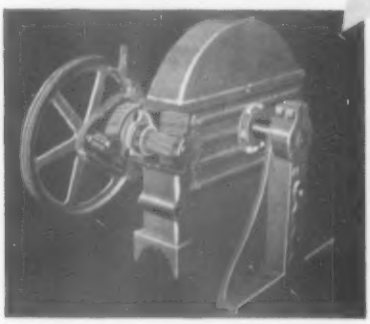
Bit Data

Total number of bits	45
Feet per bit	285

Equipment

12,000-15,000-ft. class.
Usual fuel: Field gas.
Water supply: Wells.
Nearest supply center: Eunice, La.
Terrain and roads: Low, level country; floods readily; requires board roads to locations.

JENSEN'S DOUBLE GEAR REDUCTION . . .



Proof of JENSEN'S Superiority!

JENSEN's Double Gear Reduction is an engineering masterpiece. It enables one man in the field to change gear reductions—from single to double or from double to single, quickly and easily. The one-man combination counterbalance is another advantage that makes JENSEN JACKS more practical and economical.

There are scores of other features that prove JENSEN's superiority . . . and you can get the facts about them from any producer who has installed JENSEN JACKS. See your JENSEN Dealer or write us at Coffeyville.

JENSEN JACKS

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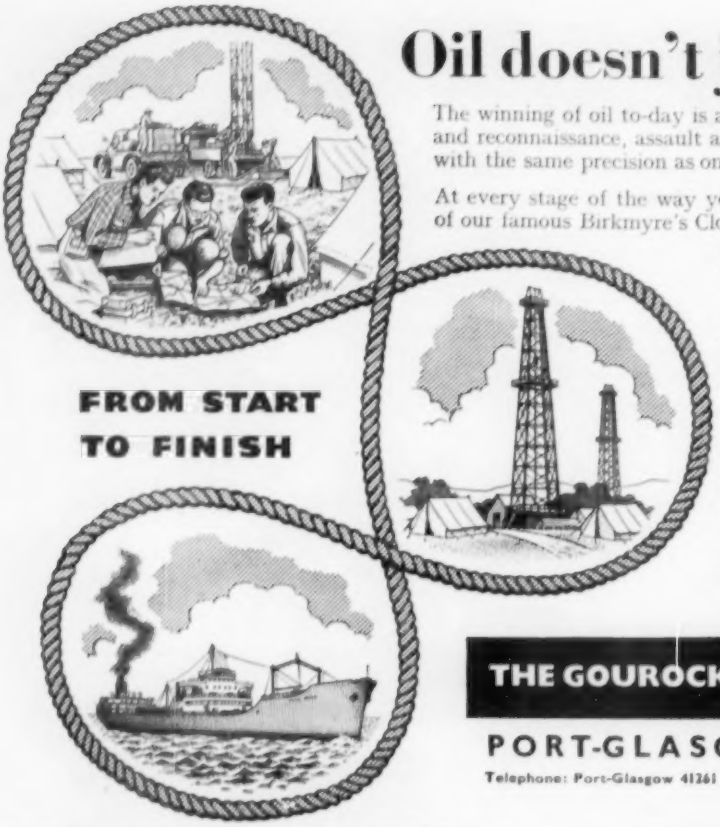
Export Office:
25 Broad St., New York City



FROM START TO FINISH

Oil doesn't just happen...

The winning of oil to-day is as finely planned as a military operation, and reconnaissance, assault and consolidation must follow each other with the same precision as on a beach-head.

At every stage of the way you will find 'Gourock' products,—tents of our famous Birkmyre's Cloth for the Survey teams, tarpaulins for protection of their stores; and later on, steel wire rope, the great indispensible. Finally, nylon, manila or terylene ropes and hauling lines for the Tanker fleets, canvas for their sun awnings and windsails, deck swimming-pools of 'Birkmyre's Cloth'—We make them all.

We're proud of the part we play in the oil industry; and just because of that (and because we're proud too of the name 'Gourock' which we've safeguarded over the last 219 years) you can be sure that whatever your stage in oil-winning you're adding to your own peace of mind when you specify 'Gourock'.

THE GOUROCK ROPEWORK CO. LTD.

PORT-GLASGOW SCOTLAND

Telephone: Port-Glasgow 41261 Telegrams: Gourock-Telex, Port-Glasgow

YOU CAN MAKE ELECTRIC AND GAMMA RAY LOGS AT ANY TIME WITH PORTABLE *Geo-Logger*

- Accurate, simultaneous self-potential and point resistivity electric logs to 6,000 ft. Fast, sensitive Gamma Ray logs run on same instrument with quick change of probe.
- Complete portability. Overall dimensions 29" long, 18" wide, 26" high, 350 lbs. max. weight. Easily installed in small trailer, pick-up, or other field vehicle.
- Simple operation for both electric and Gamma Ray logging. Technically trained operator not necessary. Prompt maintenance service provided.

Well Reconnaissance

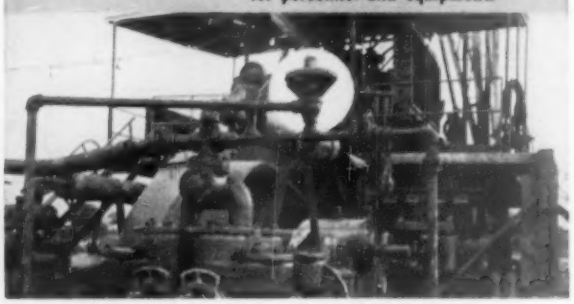
INCORPORATED

7818 Brook Hollow Road • P. O. Box 1483 • Dallas, Texas

Phone: FLeetwood 7-7372

Only KINZBACH

Automatic Mud Relief Valves provide complete protection for personnel and equipment.



Modern drilling practices demand the complete protection offered by the Kinzbach Model 112 Valves. They open automatically and instantly when the line pressure goes beyond safe limits—and when the pressure drops to a predetermined level, they close automatically.

Write today for complete literature or order through your supply store. Available in 2" and 3" sizes, from 500 p.s.i to 4500 p.s.i.

KINZBACH TOOL CO INC

KINZBACH TOOL CO., INC.

P. O. Box 277 Houston, Texas

Export Office:
74 Trinity Place, New York, N. Y.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	2,200	1,100
Intermediate	9⅝	10,500	1,200
Oil string	7	12,500	400

Mud Summary

Material—	Amount
Gel, tons	15
Barites, tons	900
Lime, sacks	800
Caustic soda, cans	200
Tannex, Carbonox, sacks	600
Mica, sacks	150
Diesel oil, bbl.	200

Usual mud program: Use maximum weight of 12.3 lb. to setting of 9⅝-in. casing; convert to 12 per cent red lime oil emulsion mud before drilling out; increase weight to 15 lb. by total depth; use mica to control lost circulation below 9,000 ft.

Geological Data

Formation tops—	Depth (ft.)
Miocene	0- 8,000
Oligocene (incl. Het thief zones)	8,000-10,000
Oligocene (incl. potential producing horizons throughout entire section)	10,000-12,500

Remarks: Some 11,500-ft. wells are completed in only 47 days.

EAST LAKE PALOURDE FIELD
Assumption Parish, Louisiana

Pay zone	Miocene
TD (avg.)	13,470 ft.

Cost Data

Footage price	$4.75-$5.00
Day-work rate with drill pipe	$1,475.00
Day-work rate without drill pipe	$1,400.00

Normal Rig-Time Distribution

Days on footage rate	18
Days on day-work rate	29
Total days (spud to rig release)	47

Bit Data

Total number of bits	31
Feet per bit	470

Equipment

12,000-15,000-ft. class.
Usual fuel: Diesel and natural gas.
Water supply: Canals.
Nearest supply center: Morgan City and Houma.
Terrain and roads: Good roads to marine landing—canal system in field.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Conductor	16	140	...
Surface	10¾	2,300	1,250
Oil string	5½	13,470	500

Mud Summary

Material—	Amount
Aquagel, lb.	680,000
Baroid, lb.	432,800
Caustic, lb.	3,200
Carbonox, lb.	8,500
Lime, lb.	6,200
Tannex, lb.	7,500
Diesel oil, gal.	25,000

Usual mud program: Low-pH- oil-emulsion mud; maximum weight 12.0 lb. per gal., water loss 8.0 cc.

Geological Data

Formation tops—	Depth (ft.)
Top producing Miocene oil sand	13,380

HOLLYWOOD FIELD
Terrebonne Parish, Louisiana

Pay zone	Krumbhaar
TD (avg.)	12,750 ft.

Cost Data

Footage price	$4.50
Day-work rate with drill pipe	$975.00
Day-work rate without drill pipe	$875.00

Normal Rig-Time Distribution

Days on footage rate	27
Days on day-work rate	5
Total days (spud to rig release)	32

Bit Data

Total number of bits	26
Feet per bit	500

Equipment

12,000-15,000-ft. class.
Water supply: Wells.
Nearest supply center: Houma, La.
Terrain and roads: Paved to lease and shell to location.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	140	150
Intermediate	10¾	3,000	1,000
Oil string	7	12,750	500

YOUR CONTROL PROBLEM IS MERCOID'S PROBLEM

WHEREVER CLOSE AND ACCURATE CONTROL IS REQUIRED FOR PRESSURE, TEMPERATURE, LIQUID LEVEL OR MECHANICAL MOVEMENT, THERE IS A MERCOID CONTROL AVAILABLE FOR THE JOB.

Type PPQ diaphragm differential pressure control operates from minute changes (.03" of water) in the difference between two pressures. Ranges available 6" vac. to 6" press., and 30" vac. to 30" pressure.

Type BB Differential pressure control for high pressures. Opens or closes a switch contact according to a change in the difference between two pressures. Available ranges 60 psi to 2500 psi.

Type DA-21 pressure control opens or closes an electrical circuit upon an increase or decrease of pressure. Can be furnished with many different circuit arrangements. Ranges available 0-14 psi. to 300-2500 psi.

Type DA-35 temperature control opens or closes an electrical circuit upon an increase or decrease of temperature. Various circuit arrangements also available. Ranges from 25-100°F. to 370-530°F.

Type DA-400 Series pressure controls incorporate a single bourdon tube which actuates two independently adjustable Mercoid magnet operated mercury switches to accomplish various circuit operations. Ranges 0-30 psi to 300-2500 psi.

Type 76KPE explosion-proof liquid level for pressures to 300 psi. Packless torque tube construction transmits float motion to two Mercoid mercury switches connected in series.

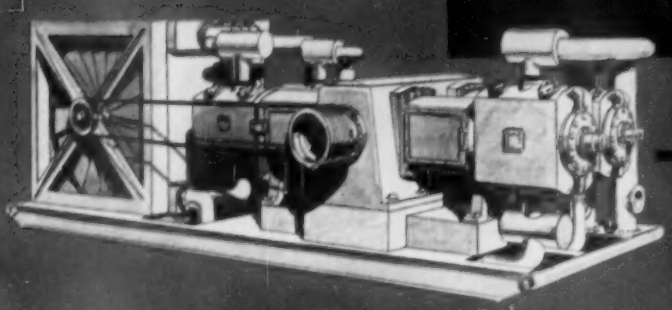
MERCOID CONTROLS ARE AVAILABLE IN EXPLOSION-PROOF OR WEATHER-PROOF ENCLOSURES

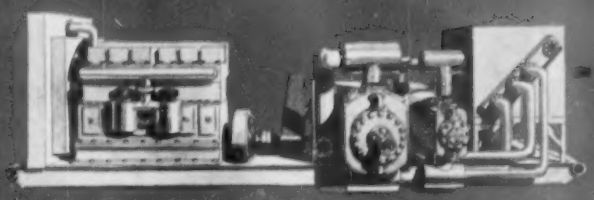
For further information write for Bulletin CA

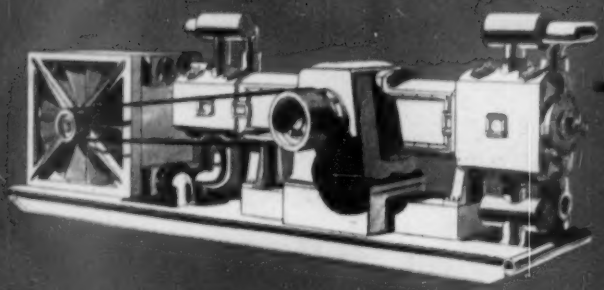
THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.

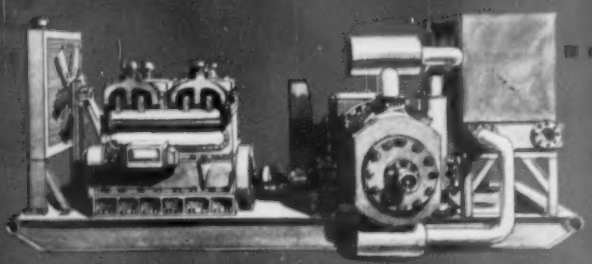
ALL MERCURY SWITCH EQUIPPED AUTOMATIC CONTROLS

COOPER-BESSEMER COMPRESSORS









Heavy Duty Compressors

New York Washington, D. C. Bradford, Pa. Parkersburg, W. Va.
San Francisco, Calif. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.

Especially Developed FOR AIR DRILLING

Another Example of Efficient Power at Lower Cost

COOPER-BESSEMER TYPE FM-4

Rig-powered, skid-mounted air drilling compressor with four syncro-balanced compressor cylinders.
Rated 350-1000 hp at 400 rpm.

COOPER-BESSEMER TYPE FMP-2

Independently powered, skid-mounted air drilling compressor with two compressor cylinders.
Type of engine used is optional
Rated 150-300 hp at 300 rpm.

COOPER-BESSEMER TYPE EM-2

Rig-powered, skid-mounted air drilling compressor unit with two syncro-balanced compressor cylinders.
Rated 200 to 300 hp at 450 rpm.

COOPER-BESSEMER TYPE FMP

Independently powered, skid-mounted air drilling compressor with single compressor cylinder.
Rated 50 to 150 hp at 300 rpm.

Today's widespread experience and experimentation in air drilling leaves no doubt about the need for true *heavy-duty* air compressor equipment. Illustrated opposite are four of the units developed by Cooper-Bessemer to meet this need.

Although compactly packaged and meeting all requirements for portability, these complete units offer the long life, continuous operation and extreme durability for which the larger Cooper-Bessemer compressors have long been known. And, since any one of these units will outlast a number of the high speed compressors commonly used, it is certain to live through a well completion, insure an increased rate of penetration and contribute to big reductions in drilling cost.

In addition to new efficiency, heavy-duty performance and proved durability, Cooper-Bessemer offers you a choice of packaged units to meet your particular needs perfectly. For example, you will note that two of the units illustrated are designed to be driven by the draw works power plant, while the other two are equipped with their own engines although the latter may also be driven by draw works engines. Moreover, since these packaged units are equipped with the same standard heavy-duty cylinders used on larger Cooper-Bessemer compressors, it is possible to cover extraordinary pressure and volume ranges and employ exceptional unloading facilities.

The nearest Cooper-Bessemer office will gladly give you complete data on the ideal setup for your requirements. Get in touch with them.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela

NEW Powerhouse on wheels!

Trailer-mounted ONAN "CW" Electric Plant

5 or 10KW

For floodlighting, operating electric tools, emergency standby use.

Goes Anywhere!

Here's real mobility in high-capacity electric plants. You can tow a trailer-mounted Onan "CW" as fast as a car will travel . . . anywhere a tractor can go. Fully-protected by heavy-gauge steel housing; stays on the job in any weather.

Onan "CW" Electric Plants are unusually compact, quiet-running and economical to operate; weigh only half as much as water-cooled plants of the same capacity. Powered by Onan two-cylinder, suction-air-cooled gasoline engines built with massive, long-wearing parts for continuous, heavy-duty service.

Write for Folder A-362

D. W. ONAN & SONS, INC.

3229 Univ. Ave. S. E., Minneapolis 14, Minn.

WIDE RANGE OF ACCESSORIES

You can equip your "CW" Electric Plant for any type of portable service. Accessories include skid, battery rack, 9-gallon fuel tank, weather-proof housing, two-wheel trailer, or 4-wheel rubber-tired dolly. *Put one of these portable, high-capacity units on your job now!*

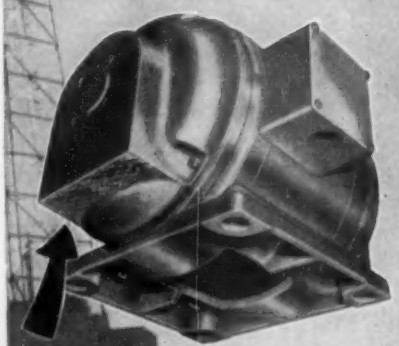
designed especially for *continuous* outdoor use . . .

FIELDMASTER BALL BEARING MOTORS

More and more FIELDMASTER Ball Bearing Motors are purchased for oil field use than ever before. Here's why: These **rugged** motors are **specially built** to meet the **tough** and **varied demands** of continuous outdoor use.

For example — heavy cast base assures alignment stability . . . heavy-duty, double-shielded, pre-lubricated bearings increase performance, reduce lubrication problems . . . high-grade silicon steel in the magnetic circuit reduces iron losses . . . wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems . . . high slip is available to take care of reciprocating load requirements encountered in pumping.

The FIELDMASTER has many other **outstanding advantages** that our distributor, the BETHLEHEM SUPPLY COMPANY, will be happy to show you. May we have them contact you . . . **without obligation?**



Screened Air Port Keeps Out Rodents!

VALLEY ELECTRIC CORP. 4221 FOREST PARK BLVD., ST. LOUIS, MO.

Distributor, BETHLEHEM SUPPLY CO., TULSA, OKLA.

Mud Summary

Material—	Amount
Weight material, sacks	4,400
Gel, sacks	150
Clay, sacks	150
Quebracho, lb.	28,000
Caustic, lb.	16,000
Lime, lb.	25,000
Starch, lb.	5,000
Mica, lb.	9,500
CMC, lb.	600

Usual mud program: Natural gel to 7,000 ft.; red to 8,300 ft.; lime to total depth.

Geological Data

Formation tops—	Depth (ft.)
Gaidry	10,090
Upper Krumbhaar	12,350
Lower Krumbhaar	12,670

LEEVILLE FIELD
Lafourche Parish, Louisiana

Pay zone	Miocene sand
TD (avg.)	10,500 ft.

Cost Data

Footage price	$5.00
Day-work rate with drill pipe	$1,200.00
Day-work rate without drill pipe	$1,050.00

Normal Rig-Time Distribution

Days on footage rate	18
Days on day-work rate	5
Total days (spud to rig release)	33

Bit Data

Total number of bits	12
Feet per bit	600

Equipment

9,000-12,000-ft. class.
Usual fuel: Diesel.
Water supply: Hauling.
Terrain and roads: Barge work.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	100	20
Intermediate	10¾	2,000	500
Oil string	7	10,500	800

Mud Summary

Mud costs per well	$4,500

Formation tops—	Depth (ft.)
Miocene pay sand	10,392-10,411

NORTHWEST BRANCH FIELD
Acadia Parish, Louisiana

Pay zone	Basal Frio
TD (avg.)	11,300 ft.

Cost Data

Footage price	$5.00
Day-work rate with drill pipe	$1,000.00
Day-work rate without drill pipe	$850.00

Normal Rig-Time Distribution

Days on footage rate	60
Days on day-work rate	30
Total days (spud to rig release)	90

Bit Data

Total number of bits	30
Feet per bit	377

Equipment

12,000-15,000-ft. class.
Usual fuel: Gas.
Water supply: Field wells.
Nearest supply center: Eunice, La.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Conductor	16	80	150
Surface	10¾	1,925	900
Oil string	7	10,930	600
Liner	5	450	75

Mud Summary

Material—	Amount
Barite, tons	850
Gel, tons	10
Lime, sacks	8
Soda, cans	6
Diesel oil, bbl.	70

Geological Data

Formation tops—	Depth (ft.)
Marginulina texana	10,420
Nonion struma	10,740
Nodosaria blanpiedi	11,100

RAYNE FIELD
Acadia Parish, Louisiana

Pay zone	Nodosaria
TD (avg.)	14,000 ft.

Normal Rig-Time Distribution

Days on footage rate	30
Days on day-work rate	120
Total days (spud to rig release)	150

Bit Data

Total number of bits	65
Feet per bit	215

Equipment

12,000-15,000-ft. class, stream rigs.
Usual fuel: Field gas.
Water supply: Wells.
Nearest supply center: Lafayette, La.
Terrain and roads: Gravel roads, flat terrain, rice fields.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Conductor	20	60	50
Surface	13⅜	2,000	500
Intermediate	9⅝	10,500	900
Oil string	5½	13,700	3,100

Mud Summary

Material—	Amount
Bentonite, sacks	300
Clay, sacks	100
Barite, sacks	2,300
Caustic soda, lb.	11,000
Quebracho, lb.	20,000
Kembrake, lb.	8,500
Lime, lb.	22,000
Starch, lb.	22,000
Diesel oil, gal.	35,000
Mica, sacks	1,000
Fibrous lost-circulation material, lb.	15,000

Usual mud program: Lime base mud broken over at about 7,500 ft.

Geological Data

Formation tops—	Depth (ft.)
Klumpp "D"	11,100
Klumpp "E"	11,150
Lower Klumpp "E"	11,375
Homeseekers "C"	11,875
Homeseekers "D"	12,250
Lower Homeseekers "D"	12,350
Homeseekers "E"	12,600
Nodosaria "A"	13,525

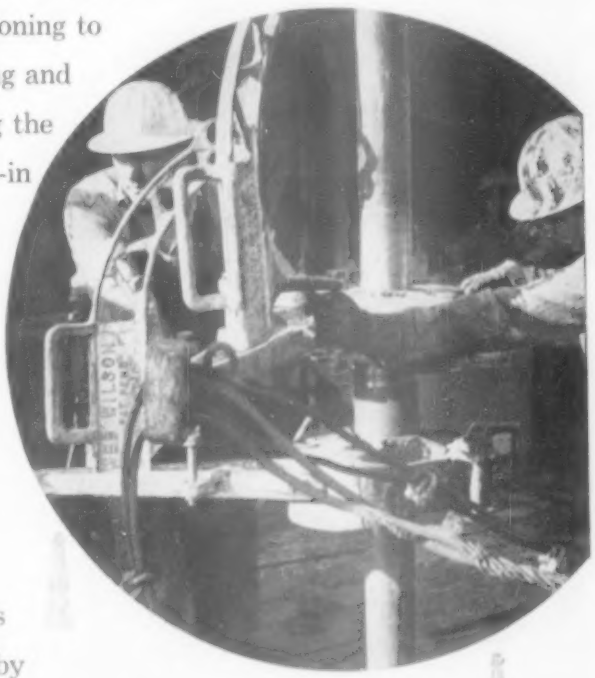
WEEKS ISLAND FIELD
Iberia Parish, Louisiana

Pay zone	8,000 to 18,000 ft.
TD (avg.)	14,000 ft.

protect NEW joints

Trying to break out galled and seized new tool joints often results in bent drill pipe. You can prevent this by making up new joints with 'Bestolife Lead Seal.

'Bestolife provides the necessary film strength and metal cushioning to prevent galling and seizing during the critical break-in period—and permits easy break out. This means long, economical life for your tool joints.



'Bestolife is stocked by leading supply houses the world over.

In 1¼, 5, 20 and 50 lb. cans.

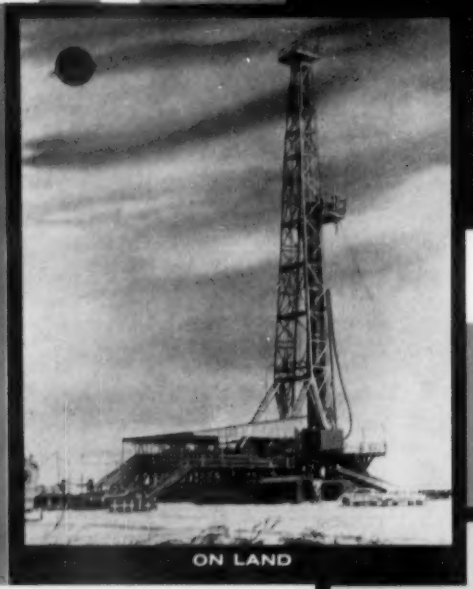
Unconditionally guaranteed.

I. H. GRANCELL
1501 E. NADEAU ST., LOS ANGELES 1, CALIFORNIA

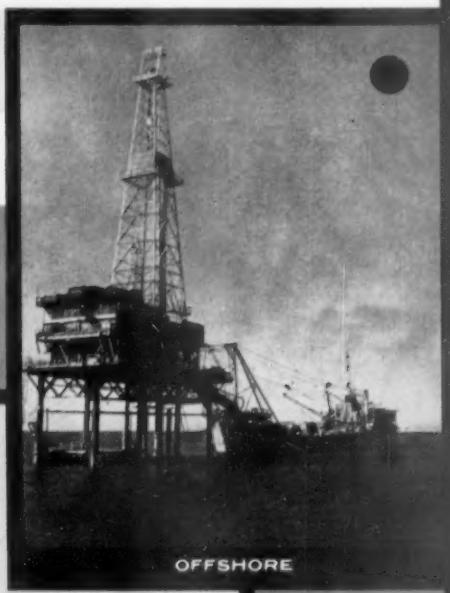
42 RIGS

MAKE HOLE
FASTER AND ***CHEAPER***
IN ANY DRILLING PROGRAM

No matter what depth or location your program calls for, Penrod has the equipment, the skilled men, the experience, to offer you big savings.



ON LAND



OFFSHORE

MODERN EQUIPMENT
– LATEST METHODS

THOROUGHLY EXPERIENCED
ORGANIZATION

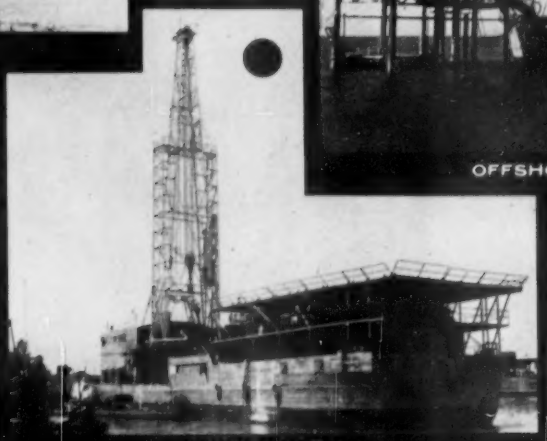
INDIVIDUAL SUPERVISION
OF EACH RIG

2-WAY RADIO
ON ALL EQUIPMENT

MODERN HOUSING
FOR OPERATING PERSONNEL

HIGH PRESSURE PUMPS
ON ALL RIGS

USE OF MAXIMUM
DRILL COLLAR WEIGHT



INLAND WATERS

CALL, WIRE OR WRITE TODAY

PENROD DRILLING COMPANY

D. K. (DEWEY) DAVIS, DRILLING SUPERINTENDENT

TELEPHONE 3-1601

418 MARKET STREET — SHREVEPORT, LOUISIANA

Normal Rig-Time Distribution

Total days (spud to rig release)	75

Bit Data

Total number of bits	27
Feet per bit	520

Equipment

12,000-18,000-ft. class.
Usual fuel: Natural gas.
Water supply: Wells.
Nearest supply center: New Iberia, La.
Terrain and roads: Swampy and black top and shell.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	3,000	(*)
Intermediate	9⅝	12,000	(*)
Oil string	7	TD	(*)

*In excess of state requirements.

Mud Summary

Material—	Amount
Bentonite, sacks	200
Clay, sacks	100
Barytes, sacks	2,000
Caustic, lb.	2,500
Quebracho, lb.	8,000

Usual mud program: Red with a mud weight of 11 lb. per gallon, at total depth.

Geological Data

Formation tops—	Depth (ft.)
Multiple oil and gas sands—	
Miocene age	8,000-18,000

SOUTH PASS BLOCK 24 FIELD
Plaquemines Parish, Louisiana

Pay zone	7,000 to 10,500 ft.
TD (avg.)	9,000 ft.

Normal Rig-Time Distribution

Total days (spud to rig release)	25

Bit Data

Total number of bits	15
Feet per bit	600

Equipment

9,000-12,000-ft. class.
Usual fuel: Diesel.
Water supply: Barge.
Nearest supply center: Harvey, La.
Terrain and roads: Offshore operations.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,500	(*)
Oil string	7⅝	TD	(*)

*In excess of state requirement.

Mud Summary

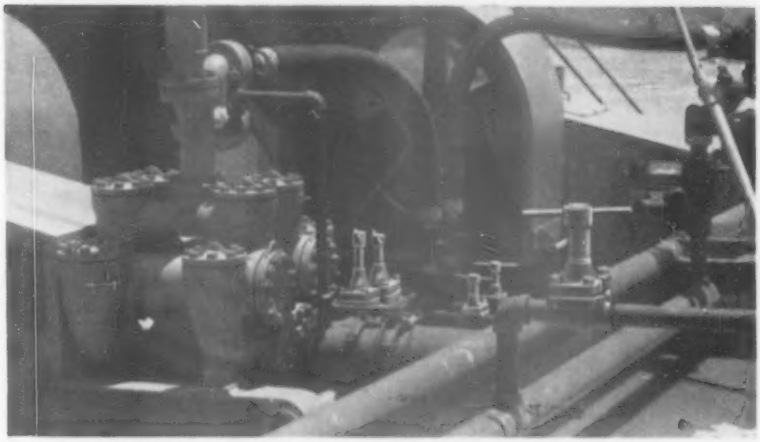
Material—	Amount
Bentonite, sacks	125
Barytes, sacks	200
Clay, sacks	100
Caustic, lb.	3,000
Quebracho, lb.	5,000
Phosphates, lb.	4,500

Usual mud program: Use 11-lb.-per-gallon mud to drill to 3,000 ft. Use phosphate in upper part of hole to control viscosity and caustic and quebracho below 6,500 ft. Mud weight below 3,000 ft. is 10.5 lb. per gallon, gradually increasing to 11 to 11.5 lb. per gallon.

Geological Data

Formation tops—	Depth (ft.)
Multiple oil and gas sands—	
Miocene age	7,000-10,000

Tips on Mud Valves for Toolpushers...



MUDWONDER valves on the mud manifold and in jet service

Rockwell-Built MUDWONDER Valves Record Two-Years on Mudlines With "Zero" Maintenance

By J. W. "Bill" Hall, Drilling Superintendent
Durham Drilling Co., Midland, Tex.

FOR THE past two years I have been using Rockwell-Built MUDWONDER mudline valves as replacements on our rigs. They are in service on jet guns, mud manifolds, fill-up lines and standpipes, and have given trouble-free operation under all conditions. In the two years since we started using MUDWONDER valves, our maintenance costs on them have been "zero" because no parts have been replaced.

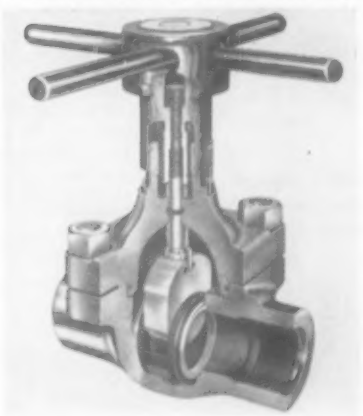
When deciding on equipment for the new rig, we checked our MUDWONDER records which left no doubt about the valve to use performance-wise and economy-wise. Needless to say, as replacements become necessary on our other rigs we plan to continue installing Rockwell-Built MUDWONDER Valves.

Freedom from maintenance is most important but easy operation is another MUDWONDER feature that makes a hit on our rigs. Regardless of pressure or position of the MUDWONDER it opens or closes quick and easy. We never need a cheater.

I can recommend MUDWONDER to anyone having mud valve trouble. MUDWONDER valves are built in 2", 3", and 4" sizes with screwed or flanged ends for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test).

Your favorite oil field supply store can give you complete information, or write Edward Valves, Inc., East Chicago, Indiana. Shipments can be made from East Chicago or the Edward Houston warehouse through the supply store you select.

MUDWONDER cut-away view shows the double thread construction, separated stainless stem and hard chromed gate with "T" slot connection and the one-piece seat insert with the buna-N molded integrally over the steel wear rings.



Always say Worthington — for Quick Delivery!

"Here comes your QD Sheave — the original two-piece design."

It's there in a flash when you order a QD sheave or V-belt from your local Worthington distributor or supply store!

QD, by the way, also stands for "Quick Detachable." The Worthington QD sheave is easy to get on, easy to get off — but always stays tight on the shaft. It's the *original* two-piece sheave.

Try your Worthington man or supply store next time you need a sheave or V-belt. You'll see why QD means Quick Delivery. MV.5.11

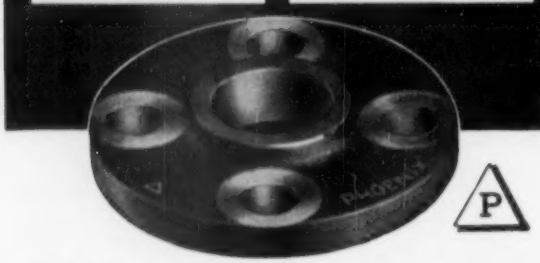
WORTHINGTON

Buy These Worthington Standard Products From Your Local Distributor

COMPRESSORS • MULTI-V-DRIVES
VARIABLE SPEED DRIVES • PUMPS

PHOENIX *Drop-Forged* FLANGES MEAN...

MAXIMUM STRENGTH

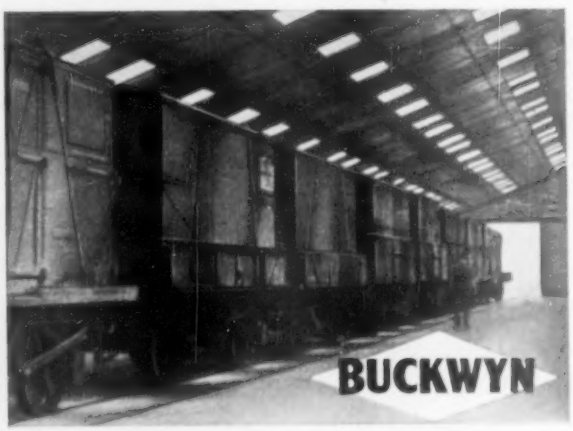


Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

NEW CATALOG!

Send for free brochure showing Phoenix Complete Line.

FLANGE DIVISION
PHOENIX MANUFACTURING CO.
Catasauqua, Pa. • Joliet, Ill.



The World's most economical warehouse

As adopted by the **British Admiralty, Ministry of Works, Ministry of Supply and Foreign Governments.**

Frame construction in tubular steel and high tensile cable, Buckwyn metal tiled in aluminum or steel with or without **insulation for all climatic conditions.**

Complete buildings from $1 sq. ft. c.i.f. American Ports.

PATENTED BUILDINGS
Areas 10,000 to 50,000 sq. ft.
Spans 63 ft. to 120 ft.

BUCKWYN CONSTRUCTIONS LTD., TWYFORD, BERKS, ENGLAND

Full particulars from Dept.: 20

Cables Buckwyn, Twyford

BUCKWYN
WINS IN THE RACE FOR ECONOMY

North Louisiana

CADDO-PINE ISLAND FIELD
Caddo Parish, Louisiana

Pay zone ..... Annona chalk
TD (avg.) ..... 1,550 ft.

Cost Data

Footage price $1.60

Normal Rig-Time Distribution

Days on footage rate 3
Total days (spud to rig release) 3

Bit Data

Total number of bits 1
Feet per bit 1,550

Equipment

Usual fuel: Butane or diesel.
Water supply: Ponds.
Nearest supply center: Oil City.
Terrain and roads: Flat, wooded; some swampy in rainy season.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	80	50
Oil string	4½-5½	1,550	150

Usual mud program: Natural mud.

Geological Data

Formation tops—	Depth (ft.)
Nacatoch sand	800
Annona chalk	1,375

Remarks: A few operators are experimenting with 2⅞-in. o.d. tubing for drill pipe, then cementing bit and drill pipe on bottom for oil string. Activity is off some from last year resulting in more competitive drilling bids.

COTTAGE GROVE FIELD
Bossier Parish, Louisiana

Pay zone ..... Top of Buckrange
TD (avg.) ..... 2,025 ft.

Cost Data

Footage price ..... $1.90 to $2.00
Day-work rate with drill pipe $480.00
Day-work rate without drill pipe $420.00

Normal Rig-Time Distribution

Days on footage rate 4
Days on day-work rate 1½
Total days (spud to rig release) 5½

Bit Data

Feet per bit 4,000

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane.
Water supply: Furnished by contractor, usually from streams.
Nearest supply center: Shreveport.
Terrain and roads: Slightly rolling; roads are poor to fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	None		
Oil string	5½	2,000	350-500

Usual mud program: Native muds with viscosity control to coring point of approximately 1,900; commercial muds used to total depth. Cost approximately $300.

FOR REAL ECONOMY

WICHTEX

WELL SERVICING UNITS

- RUGGED
- EFFICIENT
- DEPENDABLE
- ROADABLE
- VERSATILE

Wichtex units have no equal, when it comes to real, profit-building economy; low maintenance, fast, dependable operation, long life . . . all at minimum investment.

Models range from 1500-foot to 15,000-foot capacity. Write for catalog.

WICHTEX MACHINERY COMPANY INC.

BURKBURNETT ROAD — WICHITA FALLS, TEXAS

Geological Data

	Depth (ft.)
Formation tops—	
Nacatoch	1,070
Saratoga	1,450
Buckrange	1,925

COTTON VALLEY FIELD
Webster Parish, Louisiana

Pay zone	Cotton Valley sands
TD (avg.)	9,400 ft.

Cost Data

Footage price	$6.70
Day-work rate with drill pipe	$725.00
Day-work rate without drill pipe	$675.00

Normal Rig-Time Distribution

Days on footage rate	74
Days on day-work rate	25
Total days (spud to rig release)	99

Equipment

9,000-12,000-ft. class.
Usual fuel: Gas.
Water supply: Ponds.
Nearest supply center: El Dorado, Ark., and Haynesville, La.
Terrain and roads: Board.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	2,174	500
Oil string	5½	9,388	500

GRADED • GRANULAR • HIGH STRENGTH
TUF-PLUG
PAT. NO.
EXCLUSIVELY LICENSED BY STANOLIND OIL & GAS COMPANY
FINE
THROUGH THE SHAKER SCREEN
...engineered for lost circulation control
★ HIGHER STRENGTH SEAL
★ LASTS LONGER
★ SEALS F-A-S-T-E-R
★ LOWEST MAINTENANCE COST
★ PERMITS MUD WEIGHT BUILD-UP WITHOUT FORMATION BREAKDOWN
TUF-PLUG
FINE
A GRANULAR BRIDGING AGENT
AVAILABLE THROUGH YOUR LOCAL MUD AND SERVICE COMPANIES
CHEROKEE LABORATORIES, Inc.
HOME OFFICE AND MANUFACTURING PLANT IN TULSA, OKLAHOMA

Usual mud program: Regular bentonite base.

Geological Data

	Depth (ft.)
Formation tops—	
Justice sand	9,400

GREENWOOD-WASKOM FIELD
Caddo Parish, Louisiana

Pay zone	Travis Peak; Cotton Valley "D" sand
TD (avg.)	Travis Peak, 6,000 ft.; Cotton Valley "D", 8,500 ft.

Cost Data

Footage price	$6.75
Day-work rate with drill pipe	$750.00
Day-work rate without drill pipe	$700.00

Normal Rig-Time Distribution

Days on footage rate	45
Days on day-work rate	15
Total days (spud to rig release)	60

Bit Data

Total number of bits	20 to 6,300 ft. 40 to 8,500 ft.
Feet per bit	300 to 6,300 ft. 100 below 6,300 ft.

Equipment

6,000-9,000-ft. class.
Usual fuel: Gas.
Water supply: Ponds.
Nearest supply center: Shreveport.
Terrain and roads: Passable.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,000	600
Oil string	5½	6,300 or 8,500	600 or 1,000

Usual mud program: Natural mud with sufficient weighting material and chemicals to control normal bottom-hole pressure at these depths.

Geological Data

	Depth (ft.)
Formation tops—	
Top Massive anhydrite	4,450
Base Massive anhydrite	4,700
Top Rodessa	4,800
Top Pettit	5,600
Top Travis Peak	5,900
Top Cotton Valley	8,100

Mississippi

BOLTON FIELD
Hinds County, Mississippi

Pay zone	Paluxy
TD (avg.)	9,950-10,000 ft.

Cost Data

Footage price	$5.50
Day-work rate with drill pipe	$950.00
Day-work rate without drill pipe	$850.00

Normal Rig-Time Distribution

Days on footage rate	27
Days on day-work rate	10
Total days (spud to rig release)	37

Bit Data

Total number of bits	29
Feet per bit	345

Equipment
9,000-12,000-ft. class.
Usual fuel: Diesel.
Water supply: Ponds.
Nearest supply center: Brookhaven, Miss.
Terrain and roads: Rolling; roads good with Highway 80 through center of field.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,300	1,000
Oil string	5½	10,000	600

Mud Summary
Average mud bill $5,000

Usual mud program: Gel with little admixture to total depth; low-water-loss mud.

Geological Data

	Depth
Wilcox	2,600
Gas Rock	4,700
Base of chalk	6,100
Lower Tuscaloosa	7,700
Lower Cretaceous	7,980
Top of pay—Paluxy zone	9,920-50

PISTOL RIDGE-MAXIE FIELD
Forrest County, Mississippi

Pay zone Tuscaloosa, massive, Eutaw
TD (avg.) 8,600 ft.

Cost Data
Footage price $4.25
Day-work rate with drill pipe $850.00
Day-work rate without drill pipe $750.00

Normal Rig-Time Distribution
Days on footage rate 25
Days on day-work rate 18
Total days (spud to rig release) 43

Bit Data
Total number of bits 15
Feet per bit 470

Equipment
6,000-9,000-ft. class.
Usual fuel: Gas or diesel.
Water supply: Wells.
Nearest supply center: Laurel, Miss.
Terrain and roads: Average.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,500	*850
Oil string	7	TD	*1,000

*With 4 per cent gel.

Usual mud program: Fresh water-gel base mud; average weight 10.5 lb., 15 water loss to 7,000 ft.; 8-10 water loss to 8,500-8,600 ft.

Geological Data

	Depth (ft.)
Formation tops—	
Base of chalk	6,900
Top of Eutaw	6,960
Top of Tuscaloosa (base of marine shale)	7,940
Top of Massive sand	8,240

SO SO FIELD
Jones County, Mississippi

Pay zone Rodessa
TD (avg.) 12,300 ft.

Cost Data
Footage price $6.00
Day-work rate with drill pipe $850.00
Day-work rate without drill pipe $750.00

Normal Rig-Time Distribution
Days on footage rate 59
Days on day-work rate 10
Total days (spud to rig release) 64

Bit Data
Total number of bits 39
Feet per bit 315

12,000-15,000-ft. class.
9,000-12,000-ft. class.
Usual fuel: Gas.
Water supply: Wells or ponds.
Nearest supply center: Laurel.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜		400
Intermediate	9⅝		500
Oil string	5½		1,200

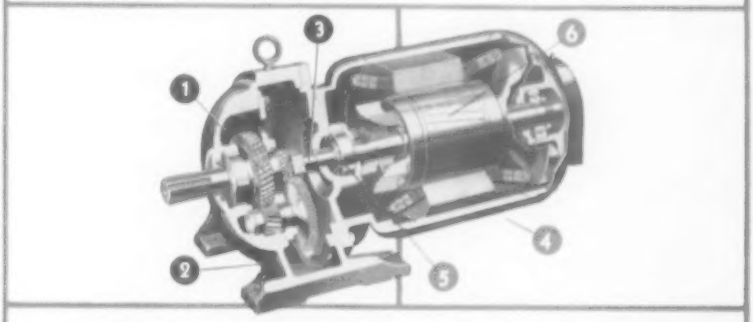
Geological Data

	Depth (ft.)
Formation tops—	
Midway	4,533
Chalk	5,137
Eutaw	6,338
Stanley	6,490
Christmas	6,690
Tuscaloosa	6,790
Lower Tuscaloosa	7,730
Paluxy oil sand	9,600
Anhydrite malker	11,237
Rodessa oil sand	11,293
Bailey	11,970

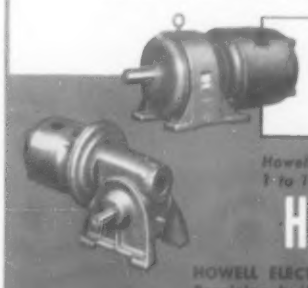
To PETROLEUM ENGINEERS. Howell suggests

What to look for in Gearmotors

1. **Lifetime gearing.** The wear-resistance of gears depends, in good measure, upon their hardness. Howell's Duti-Rated Lifetime gears have a Rockwell hardness (52-60) substantially higher than the industry average.
2. **Compact, permanently aligned case.** Machine designers like the space-saving compactness of the Howell gear case. Pyramidal mounting puts support where it's needed — avoids the shaft misalignment possible when motor and gears have separate supports.
3. **Rugged, solid-shank pinion.** Howell's pinion design, with threaded coupling and self-broaching splines, makes a failure-proof shaft connection between motor and gears. No troublesome keys.



4. **NEMA-standard motors** give machine builders and users complete motor interchangeability, help them reduce inventories and simplify purchasing. Howell gearmotors give you this valuable feature — *with the new re-rated motors included!*
5. **Fully-protected bearings** insure longer motor life. Dirt can't enter Howell's double-shielded bearings either from inside or outside the motor, because they are sealed in the end-plate cavities by dust-tight inner caps.
6. **Copper-clad rotors** mean better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your particular motor requirements. *All* Howell motors have them.



Gearmotors Cut Costs. Actual savings achieved by Howell gearmotors over separate motor-plus-reducer-plus-coupling drives are available for your study. Just request "Gearmotor Savings Table" when you write for catalog.

Write for Bulletin GM-1

Howell gearmotor capacities: Parallel shaft, 1 to 150 hp, Right angle shaft, ¼ to 40 hp.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built motors for industry since 1915

HOWELL Dual Rated MOTORS

Oklahoma

CAMRICK FIELD
Texas County, Oklahoma

Pay zone	Morrow
TD (avg.)	6,600 ft.

Cost Data

Footage price	$5.75
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	37
Days on day-work rate	3
Total days (spud to rig release)	40

Bit Data

Total number of bits	40
Feet per bit	165

Equipment

6,000-9,000-ft. class.
Usual fuel: Gas.
Water supply: Hauling.
Nearest supply center: 5 miles.
Terrain and roads: Flat.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	600	400
Intermediate	8⅝	2,700	200
Oil string	5½	6,600	300

Mud Summary

Material—	Amount
Gel, lb.	100,000
Tannin, lb.	8,000
Caustic, lb.	10,000
Starch, lb.	14,000
Lost circulation material, lb.	55,000
Oil, bbl.	400

Usual mud program: Operators are using oil-emulsion muds.

Geological Data

Formation tops—	Depth (ft.)
Lansing	5,000
Morrow	6,500
Chester	6,800

CHICKASHA FIELD
Grady County, Oklahoma

Pay zones	Lower Wellington and Pontotoc
TD (avg.)	3,400 ft.

Cost Data

Footage price	$2.75
Day-work rate with drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	6
Days on day-work rate	5
Total days (spud to rig release)	11

Bit Data

Total number of bits	8
Feet per bit	425

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane.
Water supply: Wells in south; Washita Creek in north part of field.
Nearest supply center: Duncan.
Terrain and roads: Hilly and sandy (Rush Springs on surface).

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	250	200
Oil string	5½	3,300	250

Mud Summary

Material—	Amount
Magogel, sacks	115
Soda ash, lb.	7
Caustic, lb.	6
Tannathin, lb.	28
Oil, bbl.	125

Usual mud program: Start using additives in the mud at about 1,600 ft. Gradually build viscosity of the mud; when oil zone is reached, it is about 55 with a weight of 9.5 to 9.8 lb. and a water loss around 5 cc. in 30 minutes.

Geological Data

Formation tops—	Depth (ft.)
Garber	1,400
Wellington	1,700
Top of sand zone	2,600
Pontotoc	3,200

These tops are for 5n-8w and are about 100 to 150 ft. lower as you go farther south in the field.

Remarks: In certain parts of the field the Fortuna sands of the middle Wellington are producing gas and oil. Over most of the field the pay sands are found below the top of sand zone as indicated above.

GOLDEN TREND FIELD
Garvin County, Oklahoma

Pay zones	Hart and Springer sands
TD (avg.)	9,500 ft.

Cost Data

Footage price	$5.75
Day-work rate with drill pipe	$850.00
Day-work rate without drill pipe	$750.00

Normal Rig-Time Distribution

Days on footage rate	45
Days on day-work rate	15
Total days (spud to rig release)	61

Bit Data

Total number of bits	65
Feet per bit	145

Equipment

12,000-15,000-ft. class.
9,000-12,000-ft. class.
Usual fuel: Gas.
Water supply: Ponds.
Nearest supply center: Lindsay.
Terrain and roads: Fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	550	330
Oil string	5½	8,822-9,500	450

Geological Data

Formation tops—	Depth (ft.)
Hart zone	9,100
Hart sand	9,180
Hart limestone	9,300
Lower Hart sand	9,320
Springer sand	9,500

HOOVER AREA FIELD
Garvin County, Oklahoma

Pay zones	Tuley, Huber, Randolph sands
TD (avg.)	3,900 ft.

Cost Data

Footage price	$4.25
Day-work rate with drill pipe	$550.00
Day-work rate without drill pipe	$500.00

Normal Rig-Time Distribution

Days on footage rate	26
Days on day-work rate	4
Total days (spud to rig release)	30

Bit Data

Total number of bits	30
Feet per bit	130

Equipment

3,000-6,000-ft. class.
Usual fuel: Gas.
Water supply: Ponds.
Nearest supply center: 1 mile.
Terrain and roads: Hilly and sandy.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	350	300
Oil string	7	3,850	500

Mud Summary

Material—	Amount
Gel, lb.	25,000
Tannin, lb.	6,000
Caustic, lb.	5,000
Calcium compounds, lb.	10,000
Barites, lb.	150,000
Oil, bbl.	50

Geological Data

Formation tops—	Depth (ft.)
Tuley	3,100
Huber	3,800
Randolph	3,900

KEYES FIELD
Cimarron County, Oklahoma

Pay zone	Keyes sand
TD (avg.)	4,800 ft.

Cost Data

Footage price	$4.75
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$500.00
Day-work rate—cable tools	$250.00

Normal Rig-Time Distribution

Days on footage rate	20
Days on day-work rate	1
Total days (spud to rig release)	21
Cable tools	10

Bit Data

Total number of bits	15
Feet per bit	320

Equipment

3,000-6,000-ft. class.
Cable tools.
Usual fuel: Diesel and butane.
Water supply: Hauling.
Nearest supply center: 5 miles.
Terrain and roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	1,700	500
Oil string	5½	4,800	350

Mud Summary

Material—	Amount
Cottonseed hulls, lb.	40,000
Magcogel, lb.	30,000
Fiber-Seal, lb.	6,000
Soda ash, lb.	2,500
Caustic soda, lb.	1,000
Tannathin, lb.	1,000
Lime, lb.	100
Total mud cost	$2,780.00

Geological Data

Formation tops—	Depth (ft.)
Pennsylvanian	3,200
Cherokee shale	3,900
Atoka	4,080
Morrow	4,200
Keyes sand	4,600
Mississippian	4,650
Total depth	4,800

LITTLE CHIEF AREA (WEST) FIELD

Osage County, Oklahoma

Pay zone	Burbank sand (Penn.)
TD (avg.)	3,000 ft.

Cost Data

Footage price	$3.15
Day-work rate with drill pipe	$528.00

Normal Rig-Time Distribution

Days on footage rate	10
Days on day-work rate	1
Total daps (spud to rig release)	11

Bit Data

Total number of bits	8
Feet per bit	375

Equipment

3,000-6,000-ft. class.
Usual fuel: Butane and natural gas.
Water supply: Hauling.
Nearest supply center: Shidler, Okla.
Terrain and roads: Rolling, good roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	200	150
Oil string	5½	3,000	80

Mud Summary

Material—	Amount
Barite, tons	20
Gel, tons	6

Average mud bill runs approximately $1,000.

Geological Data

Formation tops—	Depth (ft.)
Upper Layton sand	2,090
Lower Layton sand	2,270
Checkerboard lime	2,477
Big lime	2,622
Oswego lime	2,741
Prue sand	2,828
Lower Skinner	2,915
Burbank zone	2,935
Burbank sand	2,948
Base Burbank sand	3,022

MOCANE FIELD

Beaver County, Oklahoma

Pay zone	Morrow
TD (avg.)	6,600 ft.

Cost Data

Footage price	$5.00-$5.50
Day-work rate with drill pipe	$650.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	33
Days on day-work rate	3
Total days (spud to rig release)	36

Bit Data

Total number of bits	34
Feet per bit	194

Equipment

6,000-9,000-ft. class.
Usual fuel: Gas.
Water supply: Hauling.
Nearest supply center: 5 miles.
Terrain and roads: Flat, good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	600	400
Intermediate	8⅝	2,500	200
Oil string	5½	6,600	300

Mud Summary

Material—	Amount
Gel, lb.	37,000
Tannin, lb.	3,000
Caustic, lb.	8,000
Lost circulation material, lb.	38,000
Oil, bbl.	400

Usual mud program: Operators are using oil-emulsion mud.

Geological Data

Formation tops—	Depth (ft.)
Lansing	5,000
Morrow	6,500
Chester	6,800

SOUTHEAST MOORE

Beaver County, Oklahoma

Pay zone	Morrow sand
TD (avg.)	7,450 ft.

Cost Data

Footage price	$5.75
Day-work rate with drill pipe	$700.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	39
Days on day-work rate	1
Total days (spud to rig release)	40

Bit Data

Total number of bits	45
Feet per bit	187

Equipment

6,000-9,000-ft. class.
Usual fuel: Diesel.
Water supply: Wells or hauling.
Nearest supply center: Liberal, Kans.
Terrain and roads: Moderately level; roads are good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	600	500
Intermediate	8⅝	2,850	500
Oil String	5½	7,450	400

Mud Summary

Material—	Amount
Magcogel, sacks	859
Cottonseed hulls, sacks	147
Mud fiber, sacks	80
Fiber Seal, sacks	62
Salt gel, sacks	59
Lime, lb.	300
Caustic soda, lb.	1,000
Soda ash, lb.	3,300
Barium carb., lb.	2,900
Magcophos, lb.	400
Quebracho, lb.	800
Tannathin, lb.	1,250

Usual mud program: Native mud to set 13⅜-in. and 8⅝-in. Clear water to 3,500 ft. From 3,500 ft. to TD, caustic and quebracho chemical mud. Final weight, 9.3 lb. per gal.; final viscosity, 50 seconds; final water loss, 7 cc.

Geological Data

Formation tops—	Depth (ft.)
Herington	2,820
Shawnee	3,725
Lansing	5,318
Cherokee	6,278
Morrow shale	6,620
Morrow sand	6,836
Chester	6,894

WEST SHORT JUNCTION FIELD

Cleveland County, Oklahoma

Pay zone	Bois d'Arc (Hunton limestone)
TD (avg.)	8,100-8,300 ft.

Cost Data

Footage price	$4.40
Day-work rate with drill pipe	$675.00
Day-work rate without drill pipe	$600.00

Normal Rig-Time Distribution

Days on footage rate	33
Days on day-work rate	2
Total days (spud to rig release)	35

Bit Data

Total number of bits	42
Feet per bit	195

Equipment

6,000-9,000-ft. class.
Usual fuel: Gas.
Water supply: Wells.
Nearest supply center: Oklahoma City.
Terrain and roads: Level in main, sloping to Canadian River.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	850	350
Oil string	5½	8,100-8,300	350

Mud Summary

Material—	Amount
Quebracho, lb.	800
Caustic soda, lb.	3,600
Soda ash, lb.	1,000
Fiber Seal, sacks	45
Mica flake, sacks	44
Bentonite, sacks	700
Tannathin, lb.	3,150

Usual mud program: 12 per cent by volume of lease crude oil added at mud-up point which is approximately 7,500 ft.

Geological Data

Formation tops—	Depth (ft.)
Oswego lime	7,675
Verdigris lime	7,800
Bartlesville	8,000
Hunton (Bois d'Arc)	8,125

BRADLEY FIELD

McClain County, Oklahoma

Pay zones	Bromide and Oil Creek
TD (avg.)	11,600 ft.

Cost Data

Footage price	$7.00
Day-work rate with drill pipe	$800.00-$1,000
Day-work rate without drill pipe	$700.00-$900

Normal Rig-Time Distribution

Days on footage rate	56
Days on day-work rate	54
Total days (spud on rig release)	124

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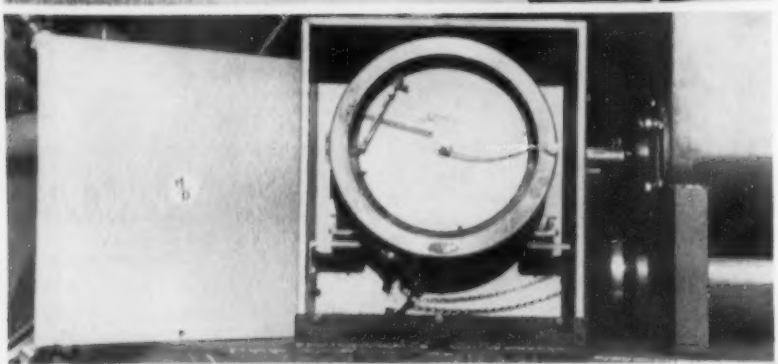

Halliburton Oil Well Cementing Company truck equipped with a Martin-Decker M-351 one-system, two-pen recorder. The truck is a continuous sand proportioner used in hydraulic fracturing operations.

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Bit Data

Total number of bits	115
Feet per bit	107

Equipment

12,000-15,000-ft. class.
9,000-12,000-ft. class.
Usual fuel: Gas.
Water supply: Ponds.
Nearest supply center: Lindsay.
Terrain and roads: Fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	1,298	1,250
Oil string	7	11,650	1,100

Geological Data

Formation tops—	Depth (ft.)
Hart zone	8,790
Hart sand	8,850
Springer	9,228
Miss. Caney	9,678
Mayes	9,845
Woodford	10,070
Hunter	10,310
Sylvan	10,617
Viola	10,770
First Bromide	11,492
Upper McLish	12,000
Oil Creek	12,460
Arbuckle	12,600

Kansas

GREENWOOD FIELD
Morton County, Kansas

TD (avg.) 3,300 ft.

Cost Data

Footage price $2.80

Normal Rig-Time Distribution

Days on footage rate	12
Days on day-work rate	2
Total days (spud to rig release)	14

Bit Data

Total number of bits	6
Feet per bit	500

Equipment

3,000-6,000-ft. class.
Usual fuel: Diesel.
Water supply: Ponds or hauling.
Nearest supply center: Liberal, Kans.
Terrain and roads: Black top and sandy clay.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	600	300
Oil string	5½	3,300	200

Mud Summary

Material—	Amount
Aquagel, sacks	100

Geological Data

Formation tops—	Depth (ft.)
Wabaunsee	2,840
Elmont	3,090
Topeka	3,240
Lecompton	3,370

Remarks: Sometimes use lost-circulation material.

Illinois

ROLAND FIELD
White and Gallatin Counties, Illinois

Pay zone Aux Vases
TD (avg.) 3,000 ft.

Cost Data

Footage price	$3.40
Day-work rate with drill pipe	$400.00
Day-work rate without drill pipe	$225.00

Normal Rig-Time Distribution

Days on footage rate	12
Days on day-work rate	3
Total days (spud to rig release)	15

Bit Data

Total number of bits	15
Feet per bit	200

Equipment

3,000-6,000-ft. class.
Usual fuel: Diesel.
Water supply: Ponds or hauling.
Nearest supply center: Norris City, Ill.
Terrain and roads: Wooded hills; dirt and chat roads and black top.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	12¾	70	75
Oil string	5½ or 7	2,950	300

Mud Summary

Material—	Amount
Gel, lb.	8,000
Quebracho, lb.	250
Caustic soda, lb.	200

Usual mud program: Mud mixed below 1,500; weight 9.5 lb., gal.; viscosity 35 cc.

Geological Data

Formation tops—	Depth (ft.)
Glen Dear	2,430-50
Golconda	2,530
Barlow	2,650-55
Cypress	2,670-2,700
Upper Bethel	2,790-2,810
Lower Bethel	2,880-2,845
Aux Vases	2,950-3,000

Canada

JOFFRE FIELD
Alberta, Canada

Pay zone Viking sand
TD (avg.) 5,200 ft.

Normal Rig-Time Distribution

Days on footage rate	14
Days on day-work rate	4
Total days (spud to rig release)	18

Bit Data

Total number of bits	9
Feet per bit	580

Equipment

6,000-9,000-ft. class.

Casing Program

	O.d. (in.)	Casing seat (ft.)
Surface	10¾	600
Oil string	7	5,200

Geological Data

Formation tops—	Depth (ft.)
Viking sand	4,900-5,200

MIDALE FIELD
Saskatchewan, Canada

Pay zone Charles
TD (avg.) 4,700 ft.

Cost Data

Footage price	$4.00
Day-work rate with drill pipe	$38.00
Day-work rate without drill pipe	$36.00

Normal Rig-Time Distribution

Days on footage rate	10
Days on day-work rate	2
Total days (spud to rig release)	13

Bit Data

Total number of bits	8
Feet per bit	600

Equipment

3,000-6,000-ft. class.
Usual fuel: Diesel.
Water supply: Hauling.
Nearest supply center: Weyburn.
Terrain and roads: Fair for Saskatchewan.

Usual mud program: Native mud; just before going into pay reduce the water loss to below 5 cc. Change mud over to gyp base at 3,800 ft. to drill anhydrite.

Geological Data

Formation tops—	Depth (ft.)
Second white speckled shale	2,630
Viking	2,950
Blairmore	3,200
Davidson anhydrite	4,250
Red Beds	4,350
Charles	4,514
Midale pay	4,570

RIMBEY FIELD
Alberta, Canada

Pay zone D-3 reef
TD (avg.) 7,850 ft.

Normal Rig-Time Distribution

Days on footage rate	47
Days on day-work rate	*20
Total days (spud to rig release)	67

Bit Data

Total number of bits	50
Feet per bit	157

Equipment

6,000-9,000-ft. class.

Casing Program

	O.d. (in.)	Casing seat (ft.)
Surface	10¾	600
Oil string	7	7,800

Mud Summary

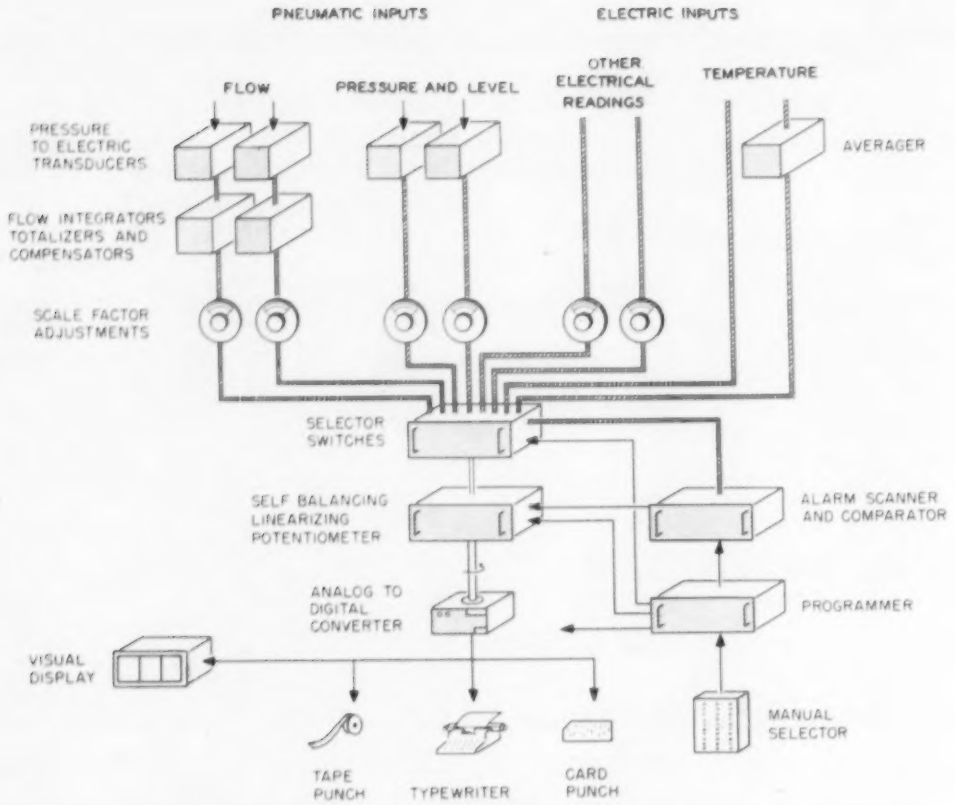
Mud bill costs about $5,000 or less.

Usual mud program: Operators use oil-emulsion muds, either lime or gypsum-base. Anhydrite occurs in the Devonian section. Colorado shales tend to slough, but can be controlled.

Geological Data

Formation tops—	Depth (ft.)
D-3 (Devonian) reef	7,800-8,000

*Considerable time is still spent coring, testing, and logging.



SCHEMATIC DIAGRAM of an automatic data handling system. Pneumatic inputs (flow, pressure and level) can be converted to millivoltage signals by individual transducers for each input channel. Fig. 1.

Why Automatic Data-Handling Systems

Speed, accuracy, safety—plus using manpower to better advantage in other duties

by Arthur H. Freilich

AUTOMATIC data logging provides advantages by way of: (1) speed, (2) accuracy, and (3) safety. It contributes to over-all plant efficiency by permitting better utilization of manpower in nonroutine tasks. Computations can be made and the results supplied to the operator in a hurry—while given operating conditions exist—not at some later time. This permits the operator to make process adjustments immediately not later on when these operating conditions no longer exist.

Process data can be presented in different forms as required for cost and inventory control.

Digital data can be transmitted electrically over long distances at high speed. A new automatic data-handling system is described here. Input analog signals are converted to discrete digital values. This system makes possible location of a central data-handling installation which can log automatically a number of plants located at distances of perhaps several hundred miles away.

Author is with Minneapolis-Honeywell Regulator Co. at Philadelphia. Paper presented at Western Petroleum Refiners Association meeting, Wichita, Kans., June 1955.

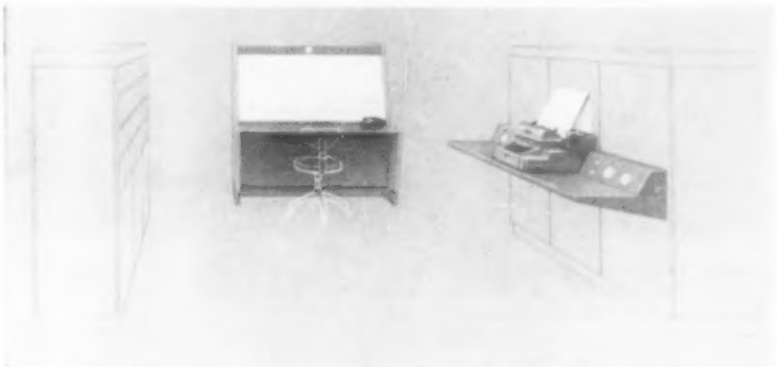
1—Human Logging

The best introduction to the field of automatic data handling is to consider for a moment what the human operator does when he makes up his log sheet showing the hourly values of process variables. If he has 100 variables to log every hour, he will check each instrument or gage in turn and enter the values in the proper columns on the log sheet. The instrument reading is what is known as an analog signal. It represents the value of the variable in terms of a deviation from some arbitrary base zero. In itself, the analog signal does not show the numerical magnitude of the variable.

Convert to digital . . . How does the operator obtain the numerical value which he writes on the log sheet? He converts the analog signal to a discrete digital value by relating it to the arbitrary zero base and measuring the deviation. In the case of a recorder or indicator, he is assisted in this job by the calibration markings on the chart or scale. Each reading that is taken, therefore, involves a conversion from the analog form to the digital form.

What else is done to the log sheet data in order to prepare it for the ultimate uses to which it is put? At the end of the shift or day, the log sheet is used to supply data for calculating other values such as total flows, average temperatures, mass flows, efficiencies,

DESIGNER'S SKETCH of data-handling system being installed now at a large eastern refinery. Fig. 2.



DATA-HANDLING SYSTEM under construction for gas blending facilities at a refinery. Fig. 3.

and similar information. The data are then split up and sent to various departments such as engineering and accounting which will further process it.

In other words, the data are calculated and manipulated to get them into the desired final forms.

Two functions . . . We see now that preparation of the log sheet and associated data can be divided into two general functions:

1. Conversion of the analog signals to the digital form.

2. Calculating and manipulating the data so as to present it in the final forms required by the various departments.

Automatic data-handling systems are designed to perform these two functions automatically without the need for human intervention.

2—Automatic Data Handling

Fig. 1 shows a schematic diagram of a typical automatic data-handling system. The inputs, consisting of analog signals from the sensing devices and transmitters, enter the data-handling system at the top of the diagram and flow essentially in a vertical direction through the system and into the readout devices at the bottom.

Instantaneous Temperature Readings

Let us consider first the thermocouple inputs, which are millivoltage signals. The selector switches sequentially choose the signals which are to be fed to the system. The selected signal actuates a Honeywell self-balancing linearizing potentiometer which measures the millivoltage signal, linearizes it with respect to the temperature, and converts the signal into an analog rotation of a shaft.

Potentiometer . . . The self-balancing linearizing potentiometer is essentially a nonindicating Honeywell ElectroniK potentiometer. It utilizes the time-proven measuring circuits, amplifier, and balancing motor which are used in the ElectroniK potentiometer. However, instead of driving a pen or pointer with the rotating shaft, the self-balancing linearizing potentiometer positions an analog-to-digital converter which is attached to the shaft.

Several different measuring circuits can be incorporated in the self-balancing linearizing potentiometer to handle a variety of input signals. In the case of thermocouples, a characterized linearizing slidewire is used for each type of thermocouple. All linear millivoltage inputs are handled by one slidewire. Any other nonlinear inputs would be handled by special characterized slidewires.

The balancing motor in the self-balancing linearizer will drive the slidewires, which are mounted on a common shaft, until the feedback voltage from the slidewire equals the input voltage. At this point the unit is balanced.

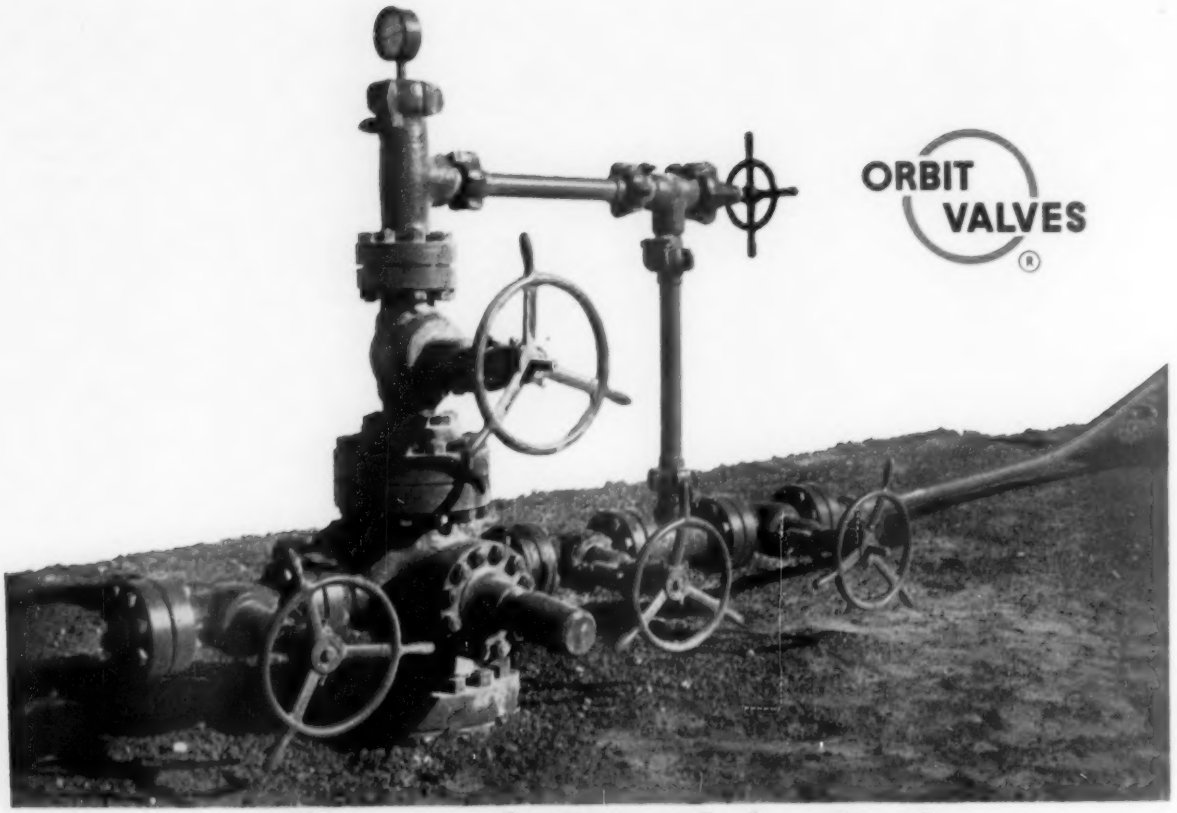
The analog-to-digital converter is ganged to the same shaft as the slidewires so that it, too, is positioned by the input signal.

Analog to digital . . . The converter is designed to produce a different pattern of electrical contact closures for each of 1,000 positions of the shaft. Thus, one rotation of the shaft can be used to cover digital values from 000 to 999, with each of the 1,000 patterns of contacts representing a specific number from 000 to 999. In this way we can convert our analog signal into a digital value. The contact closure patterns are then used to actuate the various devices so as to read out the decimal digital value corresponding to the analog signal.

The output of the converter is coded, that is, it yields an empirical pattern of contact closures for each number. The code is designed to eliminate the possibility of ambiguous or improper readings should the shaft in the potentiometer come to balance in some position intermediate to the 1,000 basic positions. It is necessary to translate the empirical coded output into a suitable code for actuating the readout devices.

Readout . . . The most common form of readout is the electric typewriter, which produces a log sheet of all the variables. At the start of each log cycle, the time is printed, followed by the digital values of all the variables printed in a horizontal row. Vertical columns, with appropriate preprinted headings, are used to identify the variables.

The log sheet can be designed to fit the exact requirements of the particular application. Up to 68 variables of three digits each plus a time marking can be put on a single horizontal line.



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How Esso Standard Logs Automatically at Bayway

by Howard M. Mathis
C. F. Braun & Co.

AN automatic installation in the poly plant control house at Esso's Bayway refinery logs the records of 100 important process variables.

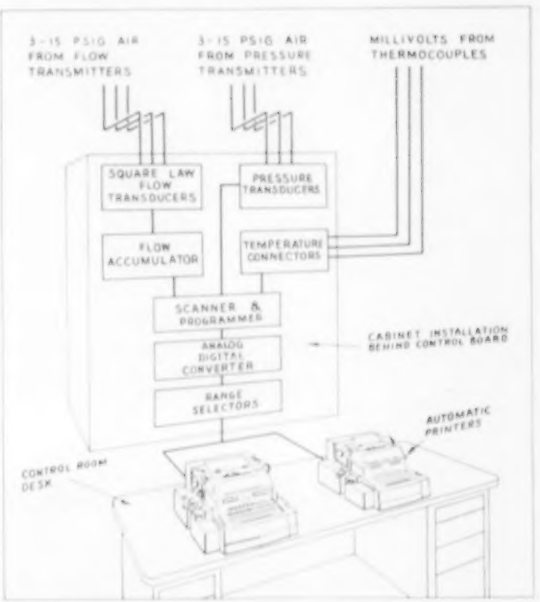
The automatic logger, first of its kind, is based on well-known principles of recording. But it applies features that have not appeared before in commercial operations. The logger records a broad assortment of flows, pressures, and temperatures on a sheet similar to the conventional log sheet. And from cumulative flow measurements, it computes and prints a record of average flow rates.

The automatic logger relieves the operator of the recording chore. The machine prints the records every hour, or at whatever other regular interval is selected. It is faster and more accurate than manual posting. It prints 100 assorted flows, temperatures, and pressures in less than 5 minutes. And, at any time between the regular hourly readouts, the operator may order a special readout by pressing a button.

The idea for the Bayway logger was originated by Esso Research & Engineering Co. and Esso Standard Oil Co. people. C. F. Braun & Co. installed the equipment as part of its over-all responsibility for the design and construction of the new cat poly unit. Since this first logger was somewhat experimental, Esso engineers stipulated that it must not interfere in any way with conventional operation and control of the plant.

When this initial installation has been proved out in service, future loggers can be simplified and included as an integral part of the control system. In that case, an automatic logger would add very little to the cost of instrumenting a unit, for the basic idea of the logger is rather simple. Temperature inputs are electrical, transmitted direct from thermocouples. Flow and pressure inputs are conventional 3 to 15-psi. air pressures, transmitted from field-mounted instruments.

The pneumatic inputs are converted into electrical impulses at the logger. All inputs then go through a scanner and programing device, to a digital converter and range selector, and finally to automatic typewriters. Fischer & Porter Co. designed and built the equipment for the system, which is shown here.



WHEN ESSO'S LOGGER has been proved out in service, future loggers can be simplified and included as an integral part of the control system.

Temperature and pressure are recorded as instantaneous readings, measured at time of readout. In the case of flow, the logger must translate pressure differentials, as measured by orifice meter, into a flow reading. This involves a square-root function. The automatic logger extracts the square root, continuously integrates the flow, and divides it by the time elapsed since the previous readout. In this way, the figure printed always represents the average flow per unit of time, whether the readings are made hourly, half hourly, or at any other interval.

Where more than 68 variables are logged on each cycle, the log sheet is divided into two horizontal sections so that each log prints two rows, one in each half of the sheet. Additional rows can be provided if necessary. If desirable, two log sheets can be prepared with half of the data on each by using two typewriters.

Other readout devices can be used in parallel with the typewriter. A tape punch can be utilized to punch the data into paper tape suitable for feeding computers. A card punch can put the data on punched cards. The readout devices can be actuated selectively so as to put specific data into various forms.

Programer . . . This controls the over-all operation of the data-handling system and supplies, by means of a digital clock, the time readings to be printed at the start of each logging cycle. The programer selects the inputs, measuring circuits and other necessary components for each signal, and feeds the digital values to the typewriter. It sends out pulses to initiate the various operations and receives pulses from the system to show completion of the functions.

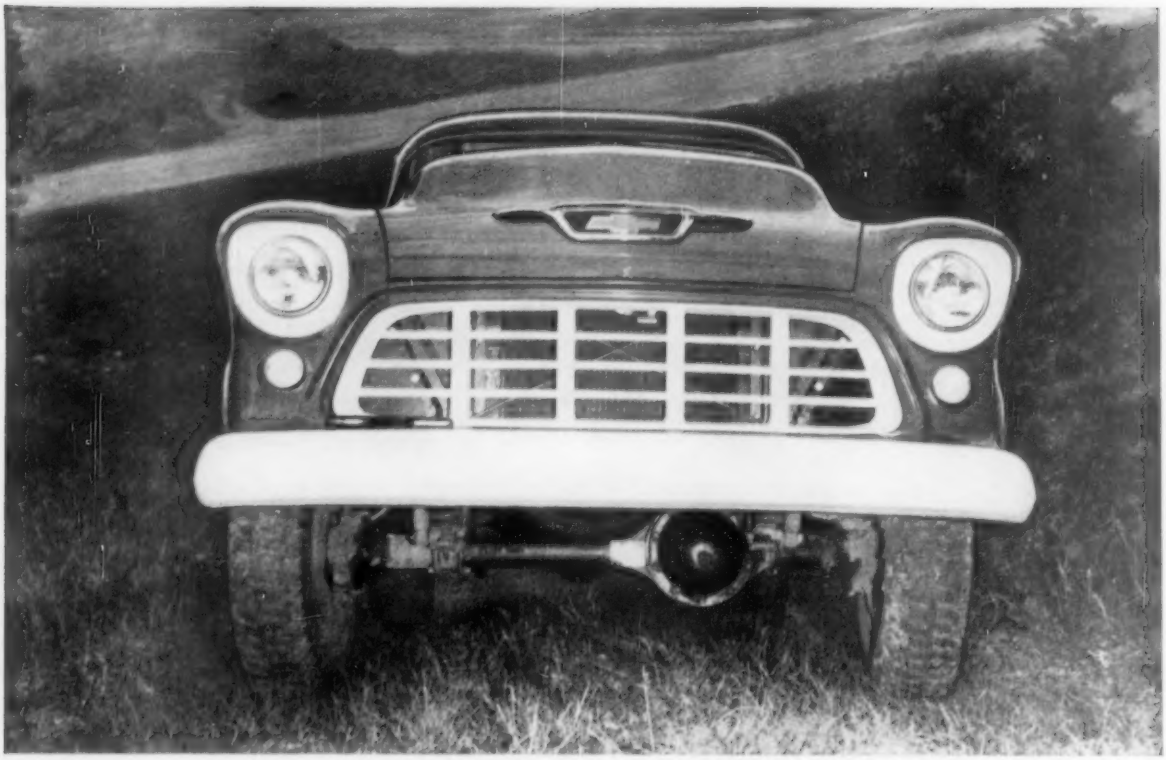
Average Temperature Readings

If an average temperature reading, rather than the instantaneous value, is desired, an averaging circuit which is an analog computing network, is used to calculate the average value of the thermocouple input and feed this reading to the data-handling system. The average temperature can be printed on each log cycle; average temperatures for a 24-hour period can be printed automatically at the end of the day.

Other Electrical Inputs

Electrical inputs other than thermocouple signals are converted to millivolts and fed to the data-handling system in a similar manner. Inputs of this type include strain-gage readings, outputs of retransmitting slidewires in remotely mounted instruments, level measurements using electrical sensing devices and electric transmission inputs. However, since a common measuring circuit is used for all linear millivoltage inputs, it is necessary to adjust the voltage levels before the inputs are measured so as to obtain the proper digital readout.

This adjustment is accomplished by



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use of multiturn precision voltage dividers on each input. These precision potentiometers are known as scale factor adjustments. The dials on the precision potentiometers are calibrated from 000 to 999; setting the full-scale digital value to be printed for a particular input merely requires setting the scale-factor adjustment.

If a range change is made on any input with a scale-factor adjustment, the only change in the data-handling system is to set the scale-factor pot to the new full scale digital value.

Pneumatic Pressure and Level Inputs

Pneumatic inputs representing instantaneous values of pressure and level are converted to appropriate millivoltage signals by use of individual transducers for each input channel. Scale-factor adjustments are used, as before, to adjust the transducer output to the appropriate digital value.

Use of a separate transducer on each pneumatic input channel results in a high degree of accuracy of measurement and also provides continuous analog electrical signals for each variable for special purposes such as averaging, integrating, or scanning.

Transducers . . . These are interchangeable and when servicing is required, the faulty unit can be removed and worked on in the instrument shop while a spare is inserted in its place, with a minimum of upset in logging operations. Failure of a transducer affects only the individual channel involved. Where inputs are detected by common measuring systems, failure of a component can lead to loss of all input data.

Transducers are of the force-balance type and are extremely accurate. Pneumatic signals are measured by a pressure sensitive element which exerts a force on a beam. Any movement of the beam is detected by an inductance circuit which varies the current flowing in a magnetic circuit. The magnetic circuit exerts a force on the other end of the beam opposing the force of the input. The current in the circuit is converted to a voltage signal and represents the output of the transducer.

The deflection of the beam is 0.001 in. maximum. This small movement eliminates inaccuracies due to nonlinearities of the pressure element and spring.

Two types . . . Two basic transducer designs are used. One utilizes a linear magnetic force unit which gives an output current directly proportional to the input pressure. The second uses a squaring magnetic force unit which produces an output current proportional to the square root of the input pressure; this unit is used to transduce square-root flow signals. Transducers utilize no tubes; a single Honeywell power transistor is used in the transducer amplifier.

Pneumatic Flow Inputs

In the case of flow, it is rarely desirable to print the instantaneous flow value at the time of the log cycle. Generally, the integrated flow for the hourly period is required, with certain total flows for the 24-hour period being logged at the end of the day. This is accomplished by use of integrating and totalizing circuits which compute the total flows based on the outputs of the individual flow transducers.

If pressure or temperature-compensated flows are desired, the outputs of the flow transducers are combined with temperature and pressure inputs in computing circuits which calculate the compensated flow. The outputs of the computing circuits are fed to the data-handling system, resulting in logging the appropriate flow value directly, without any further computation being required.

Optional Features

This covers the basic operation of the data-handling system. Two optional features are worthy of mention, however. In between the periodic log cycles, the data-handling system can be designed to scan any or all inputs at rates up to 4 to 5 points per second, comparing the inputs to individual high and low-limit settings for each point.

Alarm . . . If an input is within the normal zone, no action is taken. If, however, an input is outside of its safe operating limits, an alarm will be sounded and the data-handling system will automatically log the point number, the time, and the value of the variable. This can either be done by the logging typewriter, using a special section of the log sheet, or a separate adding-machine type of printer can be used to print all alarm data.

Scanning is independent of the logger except where a point exceeds the preset limits. This eliminates wear on the logger measuring circuits, selector switches, and analog-to-digital converter and permits high-speed scanning.

Manual selection . . . Another feature is manual selection of points. The operator can, between logging cycles, select any one point which can be visually displayed, in digital form, for continuous observation.

Other options, such as simultaneous readout, manual logging initiation, plug-in trend recorders, and manual selection of one point for continuous logging can be added to the system design.

Installations . . . Fig. 2 shows a designer's sketch of a Honeywell data-handling system which is being installed now at a large eastern refinery. The central desk houses the typewriters (in this case, two typewriters are used), the manual display features and the controls. The large cabinet at the left houses the transducers and accessory equipment for the pneumatic inputs. The cabinet on the right contains the remainder of the data-handling equipment. In this case the pneumatic inputs are 3-15-psi. transmission signals which are also transmitted to a graphic panel installed in the same control room.

This system, which includes scanning, logs about 136 variables every hour including average temperatures, integrated flows, and total daily flows.

Fig. 3 shows the designer's sketch for another Honeywell data-handling system which is presently under construction for the gas-blending facilities at a refinery. This system includes automatic inventory logging of tank levels, tank temperatures, and integrated and totalized flows. In addition, a small graphic panel shows the positions of the various valves in the component-tank and blending-tank fields and the status of the pumps. Tank level and flow-control contacts are included for switching valves and pumps in accordance with present level and flow values.

3—Automatic Data-Handling Advantages

Now, what justification is there for using data-handling systems?

What does the automatic system accomplish that is not already being done by the use of conventional instruments and the human operator?

Essentially, the advantage and justification of the data-handling system lie not in the fact that it performs the same functions as the human operator, but that it does far more and does it better.

Let us examine a few of the important areas in which the data-handling system provides advantages to management, operations, engineering, and accounting.

Speed

A human operator, logging 100 variables in a centralized control room, will spend about 30 minutes on each log cycle. As a result, data marked as having been taken at a specific time will actually be taken over a period of 30 minutes. This means that individual readings on the log sheet which are supposedly read simultaneously may actually have no relationship whatso-

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ever to each other on a time basis. Contrasted to this is the automatic data-handling system which can log at a speed of about one point per second. One hundred variables will be logged within 100 seconds of the time noted at the start of the log cycle.

If simultaneous readout of certain data is required, the selected points can be measured simultaneously, stored in memory units, and then read out sequentially as fast as the system can feed the data to the readout devices.

Accuracy

It is impossible to expect an operator to read 100 variables every hour without making errors. Fatigue and monotony are deadly enemies of human accuracy in routine operations. In addition, it has been found that some operators unwittingly bias their readings in strange ways, such as always favoring even numbers or always reading to the nearest one-fourth or one-third unit.

On the other hand, data taken by the automatic data-handling system are accurate and unbiased. In fact, at the start of each log cycle, the automatic system can check its own operation by means of a standard input and shut down and signal if its operation is faulty.

Computations performed by the data-handling system eliminate the need for calculations by the operator or accounting personnel, thus preventing introduction of human errors in the calculations.

Over-all accuracy . . . This depends upon the nature of the inputs and the computations involved, if any. Thermocouple readings can be logged with an accuracy of about ± 0.3 per cent. Pneumatic linear inputs can be read out with an accuracy of ± 0.6 per cent. Square-root pneumatic inputs will be logged with an accuracy of ± 0.8 per cent. Integrated flows will be accurate to about ± 1.0 per cent. These accuracies, of course, do not include the accuracies of the input signals.

Safety

Addition of the scanning and alarm features to the data-handling system provides extremely rapid, continuous scanning of critical data with only a slight increase in equipment. With individual alarm settings for each point, and a scanning rate of 4 to 5 points per second, the need for other instrumentation for monitoring critical variables is effectively eliminated.

Scanning not only makes the operation of the process safer but if a separate alarm printer is used, a digital trend record of alarm conditions will be produced which can be used for study of process operation and redesign of equipment where required.

Data—future use . . . Along similar lines, if a process upset occurs when a log cycle should be made, human operator will, of necessity, devote his time to restoring the process to normal, and omit the periodic logging. And yet, the upset data may be far more important for future use than the normal steady-state data.

The automatic data-handling system will go through its periodic log cycle regardless of process conditions. This yields consistent data at the desired intervals and frees the operator for the more important tasks.

Efficiency

The automatic data-handling system contributes to the efficiency of plant operation in several ways. First of all, by relieving the operator of the routine task of logging, it permits more efficient utilization of manpower. The human operators can devote their time to the nonroutine decision making tasks for which the human brain is best suited.

Computations performed by the data-handling system eliminate the use of manpower by process accounting to do the same calculations. This permits better utilization of accounting personnel.

Instant computation . . . Another way in which the data-handling system can contribute greatly to increased efficiency is in its ability to compute instantly digital data which formerly required that calculations be performed at a later time. As a result, data concerning mass flow, total flow, and average temperatures can be computed and supplied to the operator at the time that the conditions exist. This permits the operator to make his decisions and adjust his process immediately to obtain the desired results. Previously, computed figures were generally not available until much later, so that although process data told management where the process had been, it did not tell the operator where the process was going.

Different forms . . . The ability of the data-handling system to present the process data in different forms also results in efficient plant operation. The log sheet, which can normally be produced in triplicate, can be used for operational records. Selected data required by accounting for cost and inventory control can be punched into paper tape in the proper form for feeding into business machines. Other data required for future engineering use can be punched into cards for easy storage and fast access reference.

Centralization

At the present time, centralization of control of a single plant or process has been highly developed. With the advent of automatic data-handling techniques, it is now possible to centralize the control of multiplant operations.

- Digital data, being discrete values, can be transmitted electrically over long distances at high speeds with no loss in accuracy.
- The small size of the data-handling installation, compared to a conventional instrument installation for an equivalent system, permits convenient location of multiplant logging systems.
- Obviously, if human operators had to log data in a multiplant control room, the task would be tremendous. With automatic digital logging, the human operators can devote themselves to control of the processes.

One very obvious application of multiplant data handling is in setting up a centralized inventory and cost accounting system for a multiplant operation.

Pilot Plant

In pilot-plant operations, enormous quantities of data are taken. A data-handling system would automatically accomplish the required logging with greater accuracy and speed than that obtained by routine human logging. Pilot plant personnel, relieved of the logging duties, could work at a much higher degree of efficiency in carrying out trial runs and experiments.

First step . . . These are some of the general areas in which data-handling systems are of advantage. The concept of digital techniques promises even greater advantages in the future. Data handling is the first step in the direction of process control by real-time computers which will, at some future date, yield tremendous benefits in process efficiency. Before we can attain a closed-loop control system with a computer performing vital calculation and decision-making functions, we must accumulate experience in digital techniques. This, then, is a subtle long range advantage of the automatic data-handling system.

It is evident that if process techniques are to keep stride with scientific advances, new concepts in automatic control are essential. Digital techniques are the most promising approach for the future. They also offer, at the present time, tremendous advantages in process operation through automatic data-handling systems.

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Fig. 1. *Diesel-driven "Shield-Arc" welders on Linconditioning line. Welders are completely disassembled at start of rebuilding process.*

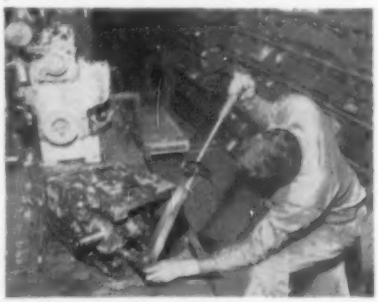

Fig. 2. *Welders are carefully reassembled on Linconditioning line. Rebuilt welders provide another full service life.*

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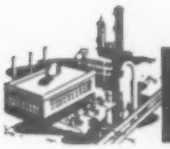

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—23

Can You Answer These Questions About Multistage Pumps?

IN multistage pumps, the increase in velocity and pressure which is given to the liquid when it passes through a pump may be used in several different ways. A pump may actually raise the liquid to a higher level, it may force it into a pressure vessel, or it may merely give it enough pressure to overcome pipe friction.

Q. Why is more than one impeller often needed?

A. Oftentimes, it is necessary to raise the pressure of a liquid more than can be done with a single impeller and volute case. When this happens two or more impellers are mounted on the same shaft, with the first impeller discharging the liquid being pumped directly into the next impeller and so on until the desired increase in pressure is obtained.

Sometimes as many as 20 impellers are mounted on the same shaft for very-high-pressure applications. In pumps having more than one impeller, each impeller and its part of the pump case are known as a stage. The stages are referred to by number in the order that the liquid passes through them as first, second, third, etc., depending upon how many impellers a particular pump may have. Pumps having more than one stage are referred to in general as multistage pumps.

Q. What's the purpose of the diffuser that's placed around the impeller?

A. Most multistage pumps, instead of having separate volute cases for each impeller, are constructed with a diffuser around each impeller. The diffuser is a hollow ring which has vanes cast inside it much like an impeller. The purpose of the diffuser is to collect the high-velocity particles leaving one impeller and direct them into the eye of the next impeller. As we have said before, a multistage pump, for all practical purposes, is only a series of one-stage pumps working together in series. Actually, high pressures can be obtained by arranging one single-stage pump to discharge directly to the suction of another single-stage pump. Sometimes this is done. However, it can easily be seen that by mounting all the impellers on one shaft, a much more compact and efficient unit will result.

Q. Why is priming necessary on centrifugal pumps?

A. It's one of the most important things to remember in the operation of a centrifugal pump. Priming may be defined as filling the pump case with the liquid to be pumped before the pump is started. This can be done in one of the following ways. If the impellers of the pump are always submerged in liquid, the pump is always ready for operation. Then it is termed "self-priming." If liquid flows into the pump under sufficient head, a valve on the discharge line must be opened temporarily so the liquid may expel the entrapped air. When a steady stream flows, the pump is primed and ready for operation.

Many pumps are provided with a small-sized line and shutoff valve connected to the highest point of the pump case. This "bleeder" is there to allow any air which may be trapped inside the pump to escape when the pump is started. (In vacuum operation the bleeder is in the form of an equalizing line back to the vessel from which liquid is being pumped). Bleeders should always be opened while the pump is being primed, but to avoid unnecessary waste, they should be closed as soon as a steady flow of liquid is obtained.

Proper priming of any centrifugal pump is very essential to good operation. A pump that is started without first being primed not only will not pump but in many cases will be damaged by running without liquid in the pump case. This is particularly true of some of our multistage vertical pumps, where the liquid being pumped actually is used to lubricate the bearings of the pump.

Q. Why is controlling suction essential to proper pump operation?

A. A liquid can neither be "pulled" nor "sucked" by a centrifugal pump, but must be forced by pressure into the impeller of the pump. A positive liquid head must be maintained on the suction at all times to actually force the liquid being pumped into the impeller. This can be best done by installing the pump well below the level of the liquid being pumped. Also, the suction pipe must always be large enough so that pipe friction will not reduce suction head very much.

The suction pipe must never be smaller than the suction opening of the pump. One or two sizes larger is advisable. This pipe should be as short as possible, and any necessary bends should be made of long-radius fittings. Some of our troubles with centrifugal pumps may be traced to just this: not having a suction line large enough to allow good flow into the pump. Also, any restriction such as a strainer or a half-open gate valve may cause a great deal of trouble.

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Kerr - McGee Oil Industries, Inc., Oklahoma City, is to drill a 10,500-ft. wildcat test for Cities Service Oil Co. in Breton Sound, off the east coast of Palquemines Parish, Louisiana. Location is in Block 50, about 3 miles from nearest land.

Glasscock Drilling Co., Shreveport, has a new operation under way for Aluminum Co. of America in the south extension area on Section 28 Dome, in St. Martin Parish, Coastal Louisiana. It is a deep Nodosaria test, designated as 1 Elmo Barras. Location is in 17-10s-7e.

Great Western Drilling Co., Midland, Tex., has a rig under contract to Oil Development Co. of Texas for another 12,200-ft. test at Crossroads, in northeastern Lea County, New Mexico. The new operation is designated as 2-26 Santa Fe. Location is in 26-9-36.

Trant Drilling Co., Dallas, has a rig working for T. M. Evans, also of Dallas, on a wildcat location 5 miles south of Grand Saline, in Van Zandt County, East Texas. It is 7,000-ft. operation at 1 Blakeley, in the A. Gray Survey.

This Loffland Brothers rig is operating in one of the world's highest fields, at Twin Butte, in western Garfield County, Colorado, 15 miles from the Utah line. It now is on an extension test, 5 Twin Butte Unit, being drilled for El Paso Natural Gas Co. on top Douglas Pass, surface elevation 8,762 ft. A fishing job has interrupted drilling the past month with total depth at 7,942 ft.

Cron & Gracey Corp., Houston, has a new water-located job. It is a 11,000-ft. wildcat test for E. Cockrell, Jr., et al., Calcasieu Lake, Cameron Parish, southwestern Louisiana. Location is on State Lease 2264, in Township 14s-10w.

Tools of **Woolf & Magee,** of Tyler, Tex., are under contract to Nebo Oil Co., Inc., of Dallas, for well the latter company is drilling to confirm its Wilcox oil discovery in the Little Bayou area, LaSalle Parish, in Central Louisiana. The new operation, 40 Nebo fee, is 1,400 ft. southwest of the discovery well, completed last October with pay at 3,484-94 ft. It is contracted to 4,500 ft.

Blanton Drilling Co., Houston, has a rig running on a new wildcat test Russell Maguire, of Wichita Falls, is putting down in Galveston County, Texas Gulf Coast. Location, at 1 Taylor, in the Rafael Basquez Survey, is 2½ miles southwest of Kemah, on the west shore of Galveston Bay, and about 2 miles northwest of Dickinson field. Drilling permits calls for an 11,000-ft. test.

A. W. Eggleston is contractor on Tennessee Gas Transmission Co.'s new wildcat test 4 miles northwest of DeQuincy field, in southern Beauregard Parish, southwestern Louisiana. Location is at 1 Lutcher-Moore in 9-7s-11w. Contract is for 6,500 ft.

Wise Drilling Account, Tyler, Tex., is scheduled for a 5,300-ft. wildcat test to be drilled for Watburn Oil Co. and associates at 1 J. W. Summers estate, in the John Hunt Survey, 10 miles southwest of Rusk, in Cherokee County, East Texas.

Trend Drilling Co. will drill a 4,800-ft. test 5½ miles southwest of Dinero, in Live Oak County, South Texas. It is a joint operation of Hawn Brothers and Coastal Trend Oil & Gas Corp. at 1 Dobie et al. Location is ¾ mile southwest of McNeill field.

Exploration Drilling Co., Tulsa, has the contract for another deep test Shell Oil Co. is undertaking in the Bluit area, in southeastern Roosevelt County, New

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Mexico. Location, at 2 Bluit, in 16-8-37, is southeast of Bluit field, and about 6 miles southeast of the town of the same name. Drilling is set up for 13,000 ft.

Hugh Kirkpatrick has a rig running for Bettis & Shepherd in Klump field, near Hidalgo, in southern Hidalgo County, in Texas' Rio Grande Valley. The new operation is at 1 Nelson, in Porcion 71, only 3,400 ft. from the Rio Grande (Mexican border). The contract has just completed a 9,024-ft. dry hole for the same operators at a wildcat (1 Shary estate) in Porcion 60, 1½ miles northwest of Hidalgo.

Hall & Steward Drilling Co. is under contract to Shell Oil Co. for a 10,550-ft. test to be drilled northeast of Edison field, 10 miles west of Lovington, in Lea County, southeastern New Mexico. Location is for 3 State "ETA," in 8-16-35.

Sabine Drilling Co. has a rig assigned to a 9,000-ft. test Magnolia Petroleum Co. is starting at a wildcat location 6 miles west of New Hope, in southwestern Roosevelt County, southeastern New Mexico. Location is for 1 Martin, in 29-6-34.

Pittman Drilling Co., Independence, Kans., is moving a string of cable tools to Benton County, northwestern Arkansas, for a wildcat test to be drilled for Hal Millsap, Jr., of Siloam Springs, Ark. The test, 1 Jones, in 12-19n-31w, is 2¼ miles southwest of Bentonville. It is to be drilled to 2,600 ft., or the top of the granite.

Hagestad Drilling Co., Bakersfield, Calif., has a rig working for Sunray Mid-Continent Oil Co. at a wildcat location northeast of Wheeler Ridge field, in southwestern Kern County, California. The newly started operation is at 21-26 Springman in 26-11-20. The rig was moved in from McLure Valley.

Delta Gulf Drilling Co., Tyler, Tex., is being kept busy in the Section 28 area of St. Martin Parish, southern Louisiana, where it is drilling for Aluminum Co. of America. The operator now is on its fifth wildcat test, 1 Phillips Barras, located in 47-10s-7e, off the south flank of the salt dome.

Loffland Brothers Co., Tulsa, is drilling for Kerr-McGee Oil Industries, Inc., of Oklahoma City, at a projected 14,500-ft. test 3 miles northeast of Grand Chenier field, in the coastal marshes of Cameron Parish, southwestern Louisiana. The test is designated as 1 Kerr-McGee and Monterey Miami Corp. Location is in 32-14s-4w.

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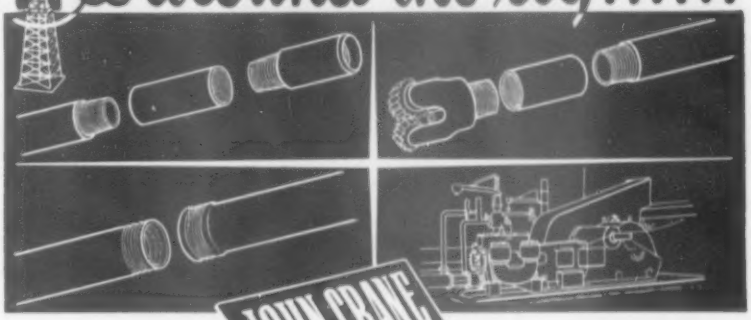

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1 First cut is started and escaping gas is ignited. Man at 4-in. valve will control height of flame.

2 Final few inches of cut are made with lineup clamps in place. Small tubing at base of control valve is from high-pressure gas bottles which supply extra gas.

3 First cut is sealed and banded. Wet canvas held around pipe by steel bands will prevent gas escaping while other cuts are made.

4 Final cut in center of section. Flame is controlled by operator on nearest 4-in. blowoff valve.

Here's the technique one company has worked out for . . .

Using "controlled fire" to repair gas lines

by Harry W. Gavin

WHEN work on a gas line involves cutting or welding, the work must be done in a way that prevents formation of an explosive mixture. Southern Counties Gas Co. has developed its own techniques for doing this. The method is one using a "controlled fire."

Basically, the method is to allow a little gas to escape through the cut or weld and to burn while work is going on. Amount of fire is controlled by pressure on the section. The section of line being worked on is first isolated by closing main-line valves, and is then blown down to almost zero pressure. Then the amount of gas escaping, and hence the amount of fire which has

Author is transmission pipeline supervisor, Southern Counties Gas Co. Digest of paper presented at the tenth annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

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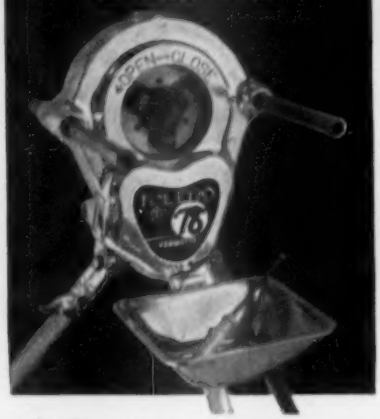

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5 New section being lined up. Original pipe has wet canvas seal over end.

6 Split clamps are then bolted on and sealed gas-tight with friction tape.

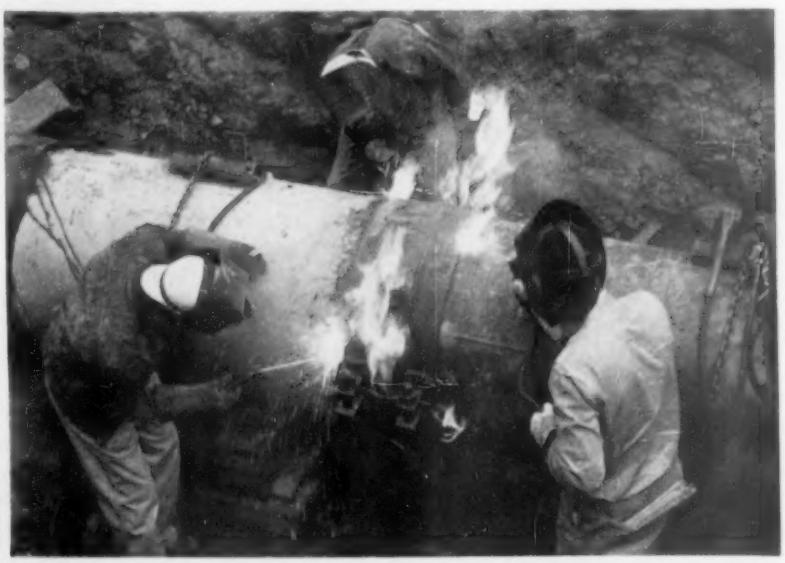
to be dealt with, is controlled by blowoff stacks and valves installed near the point of cut.

Southern Counties has found work of this type takes plenty of advance planning. For example, a detailed set of instructions to maintenance crews doing the work is put out before each job. The following is taken from one such set dealing with raising a 168-ft. section of 30-in. main line. The line had to be raised to allow a flood-control pipeline to be laid beneath it. A five-man crew did the tiein work in about 8 hours and 40 minutes.

Preliminary work . . . Everything possible is done before the line is shut down and the actual cut made. All excavation is completed, the new section is welded up, coated, purged, and capped, and all other preparations for welding in the new section are carried as far as possible. Blowdown stacks with valves are then installed at the points to be cut and the section is isolated by closing the nearest valves.

The new section is purged by installing a 1½-in. flexible tubing from the exhaust on an air compressor to a nipple installed in the night cap. After purging, the section's night caps are sealed.

With all preparations made, the iso-



7 Welding split clamps completes tiein at one point. While welding is going on fire is still controlled by blowoff valve.

lated section is blown down to almost zero pressure. Then rectifiers on the line are turned off and a bonding cable is placed across that part of the line to be removed. This removes any chance of static igniting escaping gas after the controlled fire has been extinguished.

First cut . . . Blowoff valves at mainline-valve locations are now closed and remain closed for the rest of the operation. All leakage for cutting and welding is now controlled at the 4-in. valve and blowdown stack installed at the job location. Fig. 1 shows the first cut being made. Mud is used behind the torch to reduce the amount of fire and also to conserve gas if shutoff is almost complete.

We cut at the highest end of the section first and work away from the stack on cutting and back to the stack on welding. Note in the picture the ¼-in. line which is connected to the blowoff control valve. This is to a high-pressure gas bottle which furnishes gas in case the flame burns low.

The last few inches of cut are made with lineup clamps on the line. The flame is put out before the clamps are put on. Wet canvas is wrapped around the cut to put the fire out. Then the clamps are installed and the cut completed. Two or three thicknesses of friction tape are placed over the area of the cut except the uncut part on top of the line. This confines escaping gas to the immediate area of work, making fire control easier.

Sealing the cut . . . After the cut is finished the fire is put out, the clamps are removed, and wet canvas is wrapped around the pipe. This is held in place by tight steel bands and will remain until the other cuts are made and the section is ready to be removed. Because pressure is very low, the canvas prevents leakage.

Other cuts . . . The section is then cut

8 Completed tiein, ready for coating and backfilling. Note that 4-in. stack and valve are removed, bull plug placed on line.

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loose at the other end, using the same procedure as for the first cut. Finally, a third cut is made at about the middle of the section. For this last cut the nearest blowoff valve is used to control fire during cutting operations.

If the line is in compression, two cuts may be necessary at any one point. If this is true, the cuts should be made with the bevels toward each other so the pipe coupon may be removed easily.

After these cuts are made, the two pieces of the section are removed. Open ends of the pipe left in place are sealed with wet canvas to prevent escape of gas or entrance of air while the new section is being put into place.

Installing a New Section

The new section, still filled with inert gas and capped, is lowered into position. At this stage both ends of the main-line pipe are still sealed with canvas. So the first step is removal of the night cap from the new section and the corresponding canvas cap from the main line. This joint is then correctly lined up and a split welding clamp is bolted in place around it. The clamp is sealed against gas leakage with friction tape applied to the circumferential and horizontal edges.

The night cap from the other end is now removed, and the newly positioned section is purged of its inert gas. A ½-in. line has previously been installed around the upstream gate valve for letting in gas for this purpose.

After purging, the canvas cap is removed from the main line and the new section is lined up. Another split welding clamp is bolted in place here. The section is now held in place with clamps at both ends and is ready for final welding. Necessary cribbing and backfilling has been done so that no strain is on the line.

Tiein welding . . . Tiein welding is done at one end at a time. As soon as seal welding is completed at one end, the friction tape is removed from the other clamp and welding proceeds there. Gas is allowed to escape and burn while the clamps are being welded.

Next, the 4-in. fire-control valves and blowoff stacks are removed and bull plugs are placed on the openings. Finally, the line is packed and placed back in operation.

Southern Counties feel this is the safest way to make a section replacement. But regardless of the method used, thorough job planning is very important. The main rule to follow when using this "fire control" method is to keep the line filled with gas at all times. This can be done readily except when installing the new section. Even then it can be done immediately after purging.

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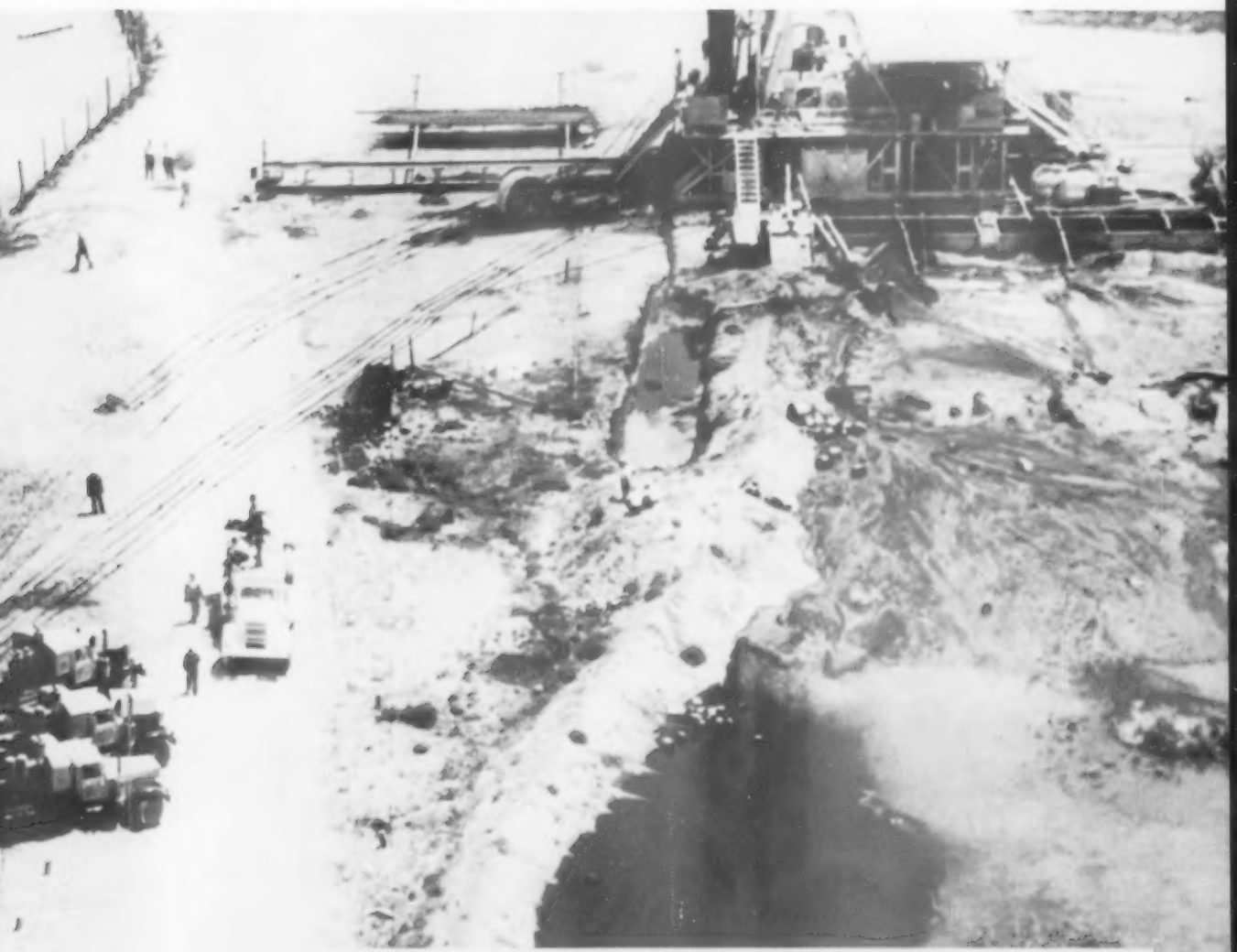

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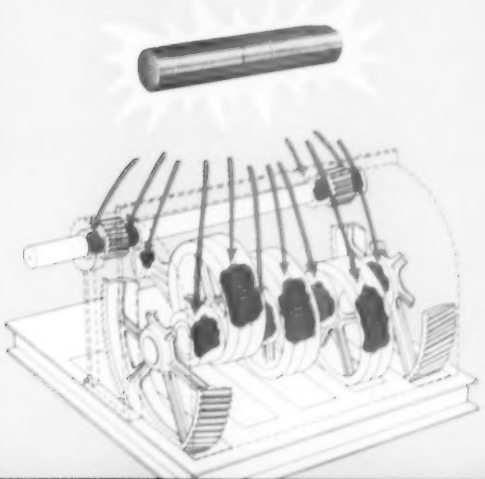

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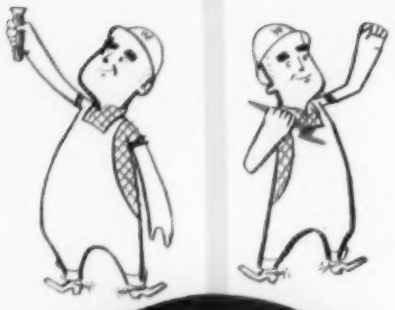

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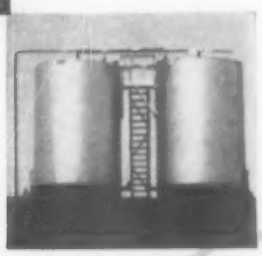

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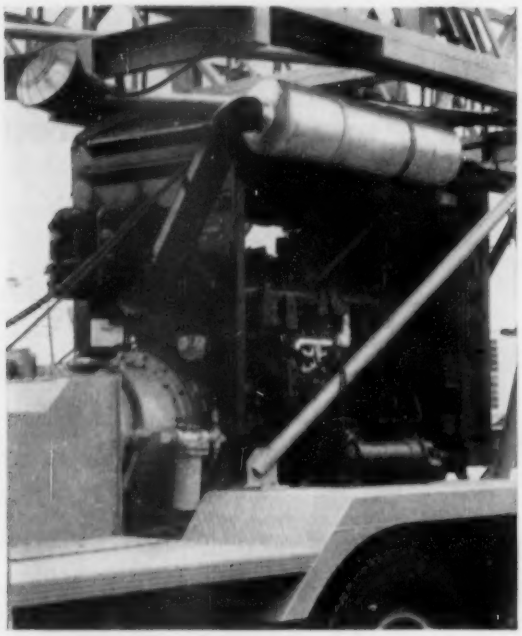

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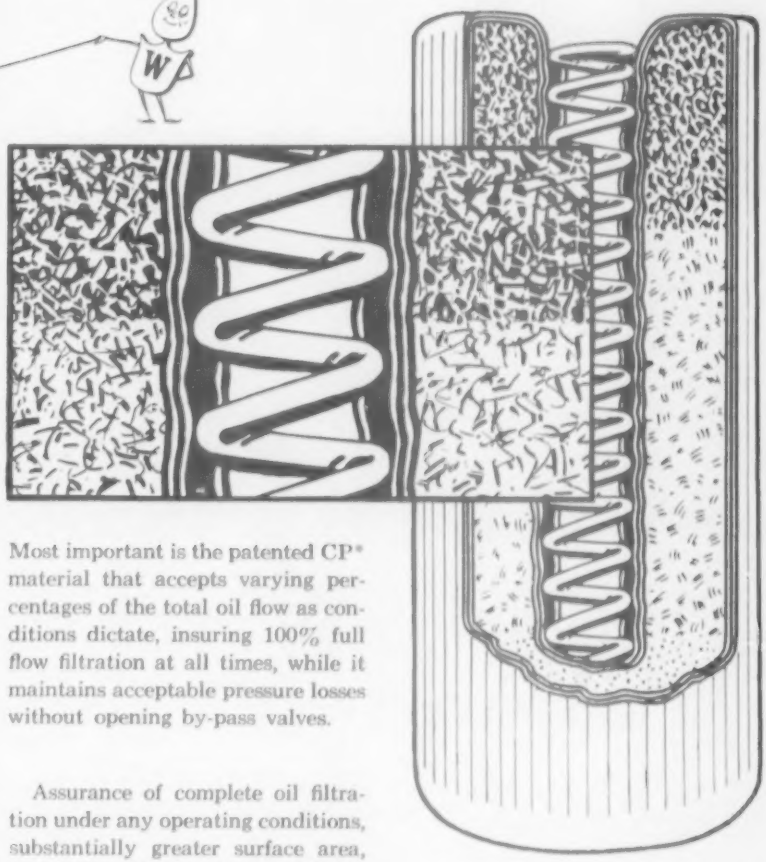

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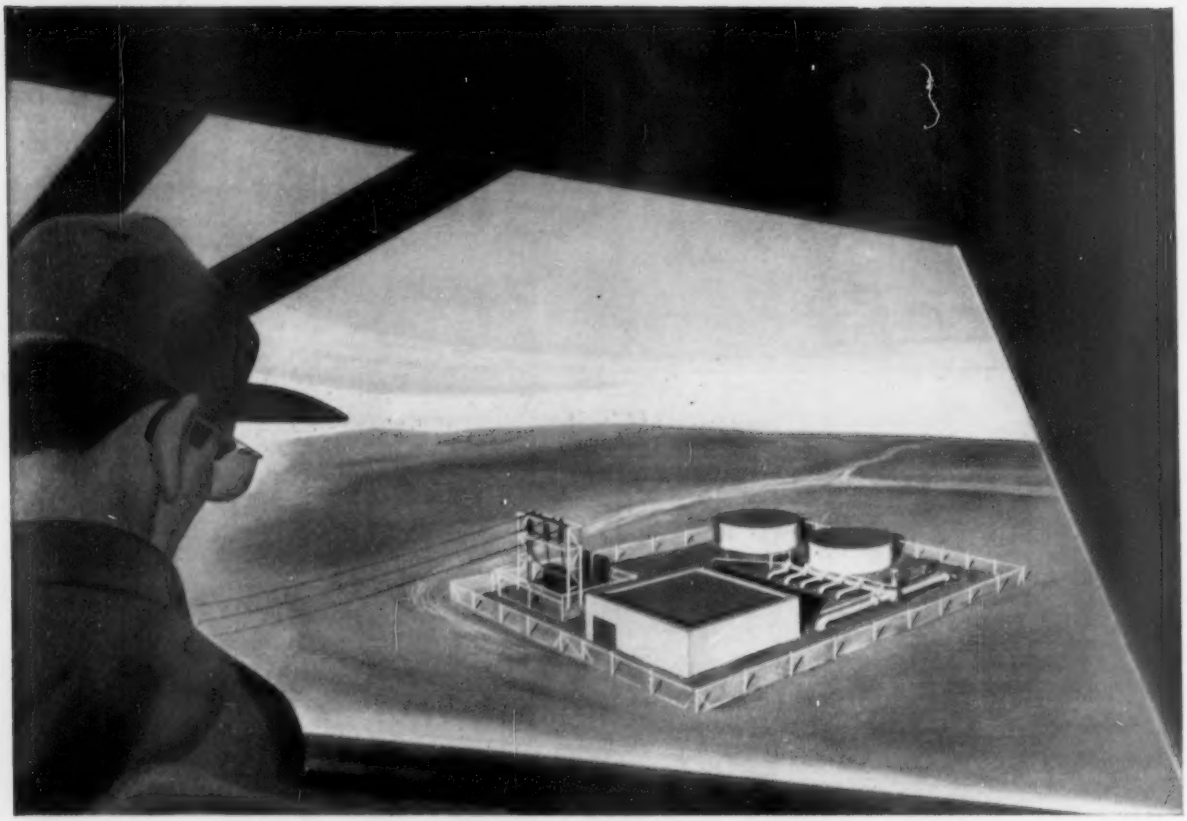

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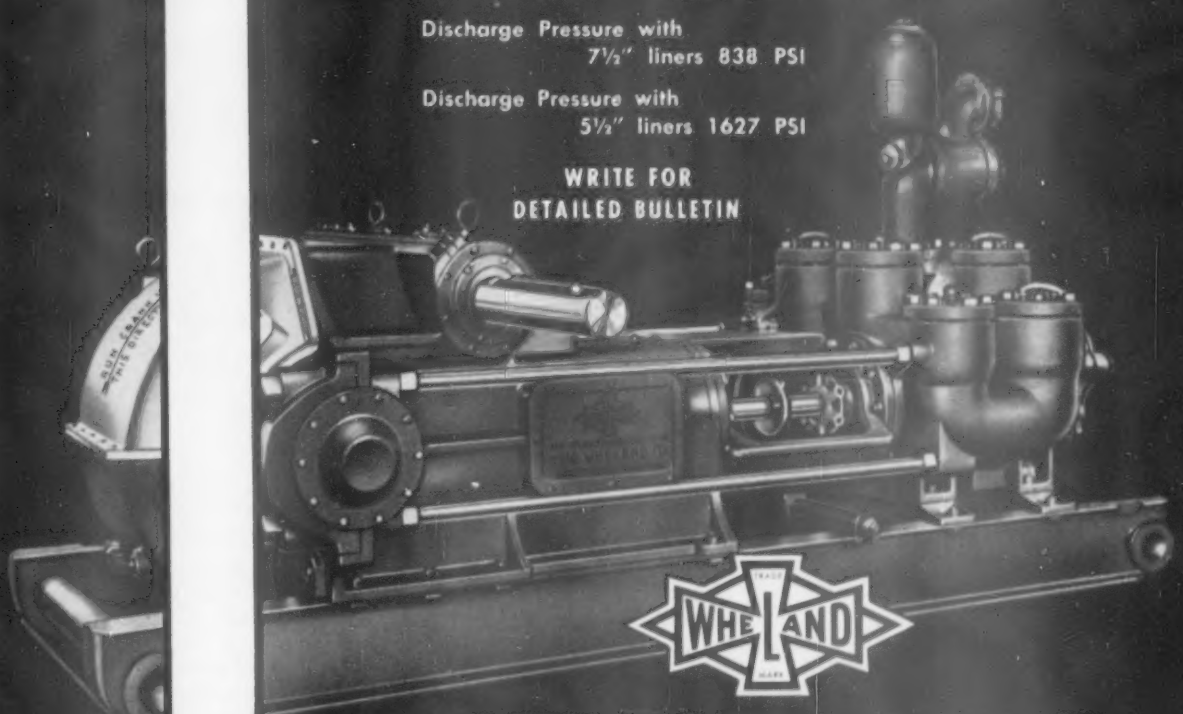

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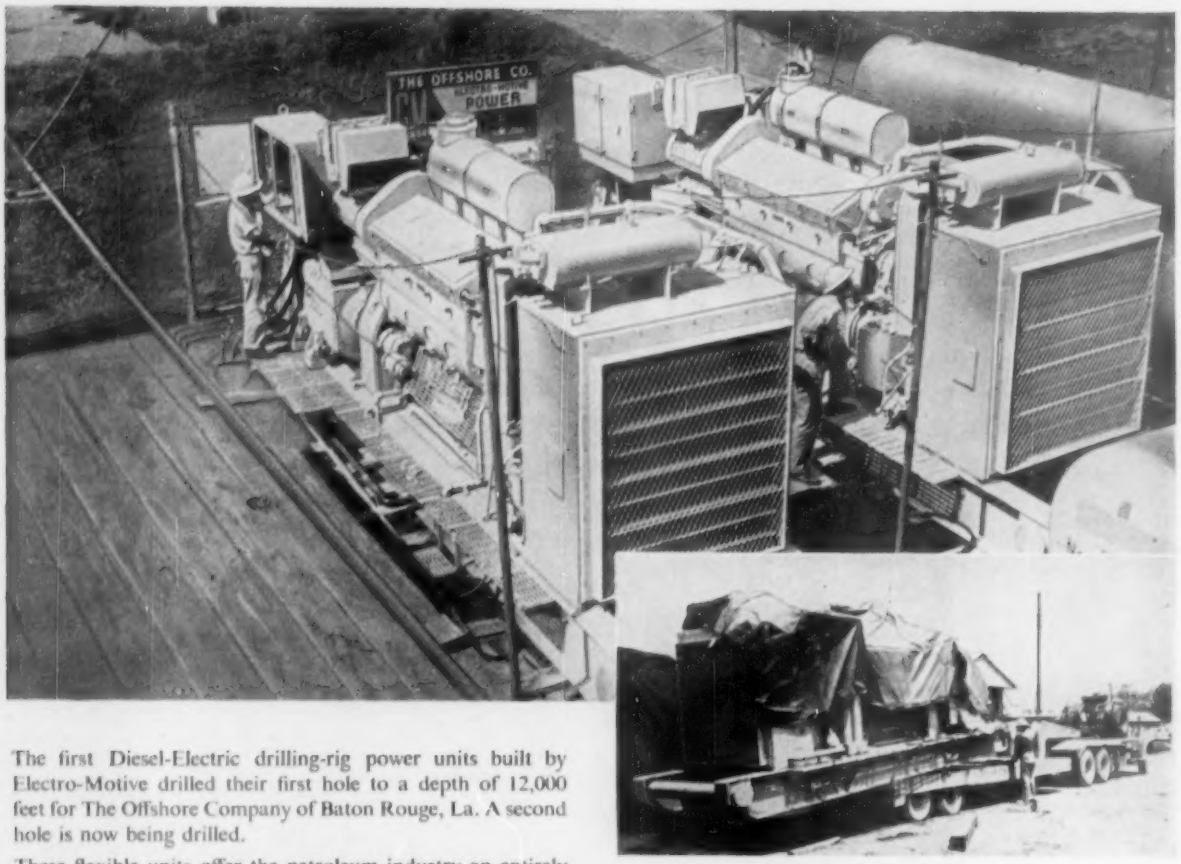

Maximum portability of Electro-Motive Power Units is shown in this photo of skid-mounted 8-cylinder Diesel engine-generator set being delivered to Offshore Company drilling site near Houma, La.

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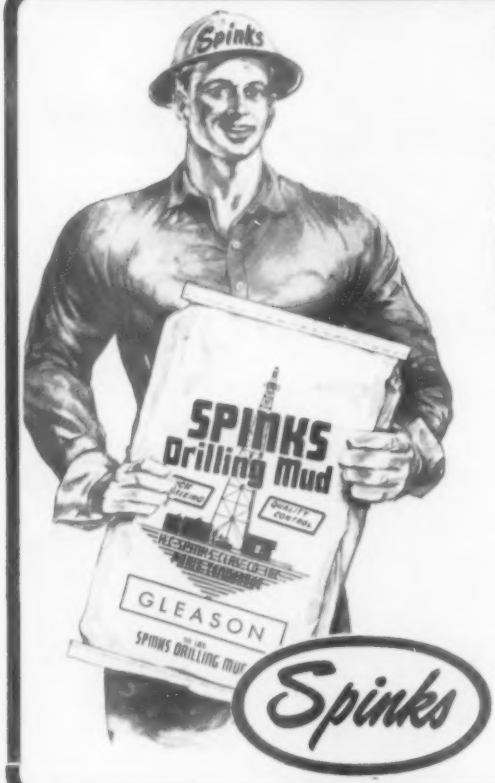

DRILL WITH SPINKS . . .

for Higher Capacity Wells!

SPECIAL DRILLING MUDS MINED AND PROCESSED FOR WATER WELL DRILLING

- **SPINKS Gleason**—an easy-mixing drilling mud — washes out of water bearing formations quickly, easily . . . minimum penetration! Makes heavy mud in 9.5 lb. to 10 lb. range . . . stops unconsolidated formation cave-ins! Excellent lubrication properties . . . proper viscosity for removing cuttings quickly, thoroughly! Durably sacked in strong, water-repellent asphalt lined bags! 50 lb. size for easy handling . . . less chance of loss!
- **SPINK-Gel**—high yielding, finest quality Wyoming bentonite. Low water loss! Exceptional lubricating qualities! Requires little to make viscous mud that floats cuttings.
- **SPINK-O**—medium weight mud, low filter loss! Combines outstanding qualities of Gleason and Spink-Gel.

Get the job done quicker . . . more economically with Spinks!

Distributorships now open in several choice territories!

H. C. SPINKS CLAY COMPANY, INC.

POST OFFICE BOX 829, PARIS, TENNESSEE • PHONES 1502 AND 1503
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Please Contact Our Nearest Office

HC *The* Quality Brand HC

pre-assembled **VACUUM TANK**

Ready to Mount on Your Truck

SELF-CONTAINED MODEL WT is made with capacities of 35, 40, 45, 50 and 55 bbls. Comes complete, ready for work. Has its own gasoline engine, pump and 4-way valve.

THOMPSON, the originators of the unitized vacuum tank, now makes available this self-contained model WT. It's factory-readied for you to mount on any CA 120" truck in your own shops. Put the WT on your truck in the morning; put it to work after lunch!

WRITE FOR SPECIFICATIONS, complete with blueprinted mounting instructions. If you'd like to see a Thompson Unitized Vacuum Tank at work, we'll tell you where, in your own area, you can watch it save time and money — pay for itself time and time again. Write today.

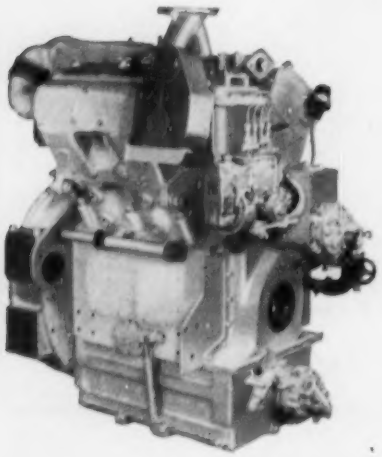
FOR SUPER-FAST CLEANING OF:

- CRUDE TANKS
- DRAIN BOXES
- RUN-DOWN TANKS
- SEPARATOR BOXES
- CAUSTIC TANKS
- DRAIN LINES
- CATALYST SLURRY
- And a hundred other field, refinery and pipeline chores.

THOMPSON
TANK and MANUFACTURING CO. Inc.
2019 EAST WARDLOW RD. LONG BEACH 7, CALIFORNIA

SOLE LICENSEE TO MANUFACTURE VACUUM TANKS UNDER U. S. PATENT No. 2522077

"... you can't beat these PAXMAN POWER UNITS for slugging power under rugged conditions!"

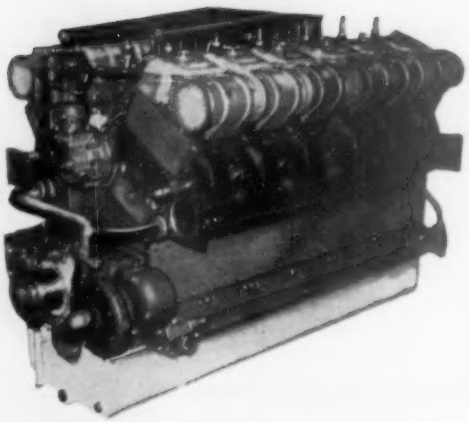


... they've been in the oil fields of the world for over 9 years.

... there's 70% interchange of parts in the 7" bore range.

... they're made in a one-cylinder size from 100 to 1,000 b.h.p.

... they're part of a range of diesel engines 100 to 2,000 b.h.p.



PAXMAN DIESEL ENGINES FOR OIL WELL DRILLING

DAVEY, PAXMAN & COMPANY LIMITED COLCHESTER *(ASSOCIATED WITH RUSTON & HORNSBY LTD. LINCOLN)*

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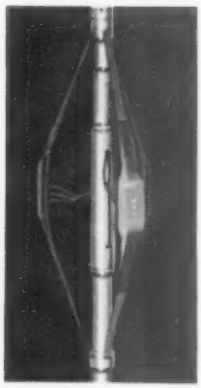


YOU CAN GET A WEALTH OF ACCURATE INFORMATION with the SCHLUMBERGER CONTINUOUS DIPMETER

A THREE-IN-ONE SERVICE
Combining
THE DIPMETER,
THE DIRECTIONAL
AND THE MICRO-CALIPER SURVEYS

This improved Schlumberger **three-in-one** Dipmeter will do more than any similar service to help solve your structural, stratigraphic and production problems. It gives you these never-before-available money saving advantages:

A Directional Survey and a Micro-Caliper run simultaneously with the Dipmeter **at no extra cost**. All are necessary for accurate dip resolution, but they also give you additional information valuable in the completion of your well.

Sharp formation detail is obtained by using MicroLog curves for bed correlation. This increases the accuracy of dip calculations, particularly on low angle dips.

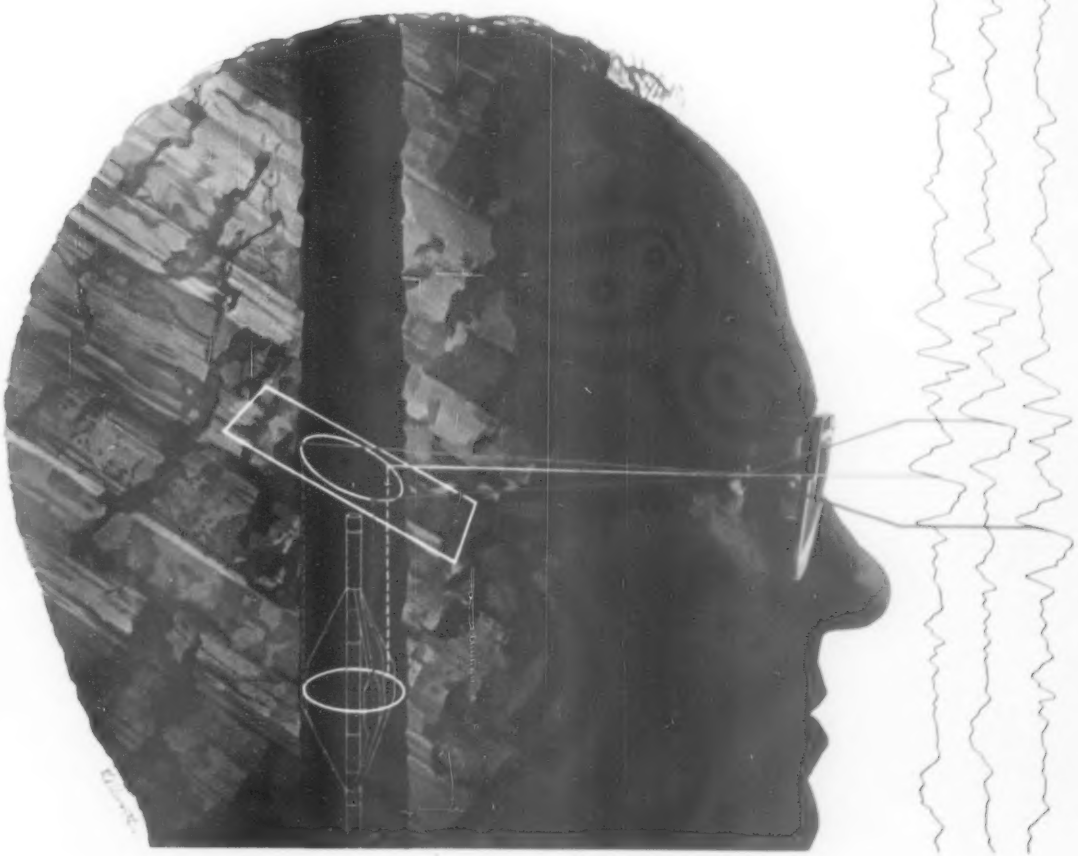
The continuous record makes it possible to accurately locate fault zones.

All measurements are recorded at the surface, thus eliminating the down-hole directional film.

It operates efficiently in high temperature wells.

It saves many hours of valuable rig time by giving you three operations in one continuous run. You can be sure of your Dipmeter Survey if it is run by Schlumberger.

THE EYES OF THE OIL INDUSTRY **SCHLUMBERGER**
Well Surveying Corporation



JELFLAKE

Durable DOWELL flakes seal "thief" zones to stop drilling mud or slurry losses

Here is effective protection against mud circulation losses . . . protection that is *not* affected by decay, water, oil, mud chemicals or high temperatures . . . nor does it form tannic acid. It is Jelflake®—an easy-to-use, fragmented plastic foil by Dowell.

Feather-light Jelflake, only 1/1000 of an inch thick, is scientifically designed to stop mud or slurry losses quickly, dependably, permanently. Its tough plastic particles both plug and plaster "thief" formations. Smaller fragments penetrate deep to stop up passages; larger ones flatten out tight against the wall of the hole.

To gain greater circulation protection per dollar, simply add Jelflake to drilling mud or cement slurry. Jelflake remains in suspension almost indefinitely. It will neither ball up nor clog equipment. One 25-pound bag can cover over 500,000 square inches.

Jelflake is available in strong, wetproof bags at major mud distributors and local Dowell stations. For more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department I-11.

services for the oil industry — DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

EQUIPMENT MEN . . . in the News

Oilwell Shifts White To Sherman District

G. B. WHITE

The transfer of George B. White, district representative for U.S. Steel's Oilwell Supply Division at Wichita Falls, Tex., to Sherman, Tex., has been announced by William Miskimis, central Midwest area manager for Oilwell. White was employed in 1950 by the division as a storeman at Anson, Tex. In 1952 he was appointed field representative and transferred to Pampa, Tex. In 1953 he was transferred to Gainesville where he was employed in the same capacity. In 1954 he was appointed district representative at Wichita Falls, where he was located before his present transfer.

Sargent Engineering Splits Mid-Continent Operations

Growth and expansion of sales during the past 2 years has made it necessary for Sargent Engineering Corp. to divide its Mid-Continent operations according to H. L. Sargent, vice president, oil-tool sales division.

O. H. Leichliter has been transferred to Fort Worth and will be in charge of the company's operations in the southern division. This includes field stores in Odessa, Snyder, Houston, Sundown, Wichita Falls, and Quitman, Tex.; Magnolia, Ark., and Hobbs, N. M.

V. A. Kelley will direct operations in the northern division, which includes Seminole and Pawhuska, Okla., Chase and Russell, Kans., and Grayville, Ill.

Sargent, builders of deep-well plunger pumps and rodless hydraulic oil-well pumps, maintains complete oil-well pump-servicing facilities in 22 field stores throughout the oil-producing areas.

Worthington Moves Barten To Gas Transmission Group

H. C. BARTEN

Howard C. Barten has been named manager of Worthington Corp.'s gas transmission section of the engine sales division, according to an announcement by W. E. Wechter, assistant to the vice president and manager of the engine sales division.

Barten joined Worthington's engine sales division in Buffalo in 1934. He later served as an estimator in eastern engine sales at the company's New York office. In 1939 he was promoted to engine specialist for the Cincinnati and Cleveland district offices. He returned to the Buffalo Works in 1942 as engine specialist and was later made assistant to the manager of the engine sales division.

Emsco Expands Machinery Sales Department

Emsco Manufacturing Co. has announced an expansion of its machinery sales department, according to W. C. Kinder, vice president and general manager of sales. Expansion will include the addition of seven sales engineers

M. A. SIMMONS

R. T. ENLOE

who will augment Continental Supply's machinery sales department.

Morris A. Simmons has been appointed assistant manager, machinery sales, with headquarters in Dallas. He will report to T. A. Ramey, Mid-Continent division machinery sales manager. The seven sales engineers will report to Simmons.

C. W. HARRISON

LOUIS GOSDEN

Ralph T. Enloe, with Emsco since 1947, will be sales manager for machinery sales for the Ark-La-Tex-Miss area

R. V. ATKINSON

G. M. COWIE

with headquarters in Shreveport. Charles W. Harrison will be in charge of the Oklahoma, Indiana, Kentucky, Kansas, and Illinois area with headquarters in Tulsa.

Louis Gosden, transferred from Emsco's machinery sales department in

Continental's New Store at Sherman, Tex.

Above is the new store of the Continental Supply Co. in Sherman, Tex. C. H. Sims is manager of the store, which will be operated under the supervision of J. E. Gallian, district manager at Wichita Falls, Tex.

A FULL MEASURE ... of SERVICE

This is especially true of the twenty Stores of Wilson Supply Company, located in Texas and Louisiana. Every Store is well stocked with a large, diversified inventory, to serve the needs of the Oil Well Drilling and Producing Industry.

From your nearest Wilson Supply Store you can get equipment and supplies of proven performance—and prices are always competitive. The Service will always be FULL measure.

"WHAT YOU WANT — WHEN YOU WANT IT"

MAIN OFFICE and WAREHOUSE - 1301 CONTI ST.

BRANCH STORES

TEXAS: Alice, Corpus Christi, Victoria, McAllen, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Sherman, Odessa. LOUISIANA: Lake Charles, New Iberia, Houma, Harvey, Shreveport.

SALES OFFICES

DALLAS SHREVEPORT SAN ANTONIO
TULSA NEW ORLEANS LAKE CHARLES
CORPUS CHRISTI MIDLAND

WILSON SUPPLY CO

HOUSTON, TEXAS

California, will be in charge of the Rocky Mountain area with headquarters in Denver. Robert V. Atkinson will

GEO. GOWER

GEO. BASQUEZ

be in charge of the West Texas and New Mexico area with headquarters in Midland.

George M. Cowie, with Emsco since 1928, has been appointed sales engineer to handle Canadian operations. He has headquarters in Edmonton, Canada. George Gower has been with Emsco since 1950 as a service engineer. In his new position Gower will be in charge of the Louisiana coast and offshore operations with headquarters in New Orleans. George Basquez, sales engineer for the Texas Gulf Coast area, will headquarter in Houston.

Delta Has New Plant Under Construction

Delta Engineering Sales Co., Shreveport, plug-valve lubrication company, has a new plant under construction. The 8,000-sq.-ft. modern brick building will house offices, processing plant, warehouse, and shipping department. The offices and plant should be ready for occupancy about November 1. Ample parking space, better highway accessibility, and a Western Union PWX promise faster, more efficient service. The new plant is on Aero Drive in one of Shreveport's larger industrial sections.

Welex Jet Names Three To Field Sales Posts

Larry Drake, formerly the Oklahoma division sales engineer for the Tulsa office of Welex Jet Services, Inc., has been named Fort Worth city salesman. Drake was sales manager and assistant district manager of the Welex office at Ardmore before moving to Tulsa.

Jerry Rushmore has been promoted to the position of sales engineer for the Pampa district office. He has been with Welex for 3½ years and has worked up through rigger and shooter to his present sales-engineer position.

Robert (Bob) J. Johnston has been appointed sales engineer for the Abilene district office. He has been with Welex since March.

A KERRIGAN
Grating for Every Need
A CATALOG
for every Grating
Write for your
Copy NOW!

STEEL
for the 1001 applications where safety and strength come first. Kerrigan Steel Grating is BONDERIZED for corrosion resistance and extra years of life.

STAINLESS and MONEL
non-magnetic steel for the chemical, oil and packing industries . . . for ANY installation where high resistance to heat, acids, chemicals, and corrosion is needed.

TRULY . . .
In both size and type, there is a Kerrigan Weldforged grating for every need. Let our new catalogs prove it to you. Send for the one you think best answers your need (or ask for ALL FOUR if you wish). We will also be glad to send you a desk-size grating sample. Write Kerrigan Iron Works, Inc., General Sales Office, 274 Madison Ave., New York City.

RIVETED STEEL
where it is desired to match existing grating.

ALUMINUM
spark-proof for those whose need is strength AND lightness. Extra safe and strong. Allowable fiber stress 15,000 psi. Modulus of elasticity 10,000,000 psi.

KERRIGAN GRATING
CUSTOM-MADE FOR YOUR JOB AND SAFE—IT'S Weldforged

Sargent

RODLESS PUMP pays off 25 to 1

"Before using Sargent, 19 hydraulic pumps averaged only 17 days each in this well. The Sargent Rodless Pump is still working efficiently after 426 days"

Such a margin may seem fantastic, but it's true. Actual well records show that 19 other hydraulic pumps averaged only 17 consecutive days each before having to be pulled and serviced. A Sargent Rodless Hydraulic Pump in the same well has continued uninterrupted operation at top pumping efficiency for 426 consecutive days *and is still operating.* That's the type of impressive performance that places the Sargent Rodless Pump in a class by itself. These same records show that this particular pump and hydraulic unit had an efficiency of 98% at the hydraulic engine and 92% at the pump. This unit has proved the best method of pumping oil and performs equally effectively in any type of well. This is not an exceptional case. In field after field, under widely varied well conditions, records prove Sargent lifts more oil at lower cost per barrel. Regardless of your pumping requirements, it will pay you to check the features and advantages that enable the Sargent Rodless Pump to get you more oil at lower cost. *Write today for complete details.*

CHECK THESE FEATURES:

The Sargent Rodless Hydraulic Pump places the long-stroke unit at the bottom of the well, where it is operated hydraulically without the need for sucker rods. Rod problems and tubing wear are thus entirely eliminated. Energized by crude oil under pressure (furnished by any suitable prime mover located at the surface), the pump requires minimum operating pressure for a given pumping depth and production capacity. Plunger bumping up and down is eliminated because the unit cannot overstroke or understroke. Pump valves are accurately spaced during assembly in the shop. The close spacing and long pump strokes yield the ultimate in gas compression ratio, thus reducing gas lock difficulties.

The pump unit can be surfaced merely by turning a valve and generally can be serviced right at the well. More than twenty Sargent Field Stores furnish standard Sargent API parts and pump service in the field.

SALES & SERVICE

CALIFORNIA
Long Beach
Bakersfield
Santa Maria
Ventura • Taft
Huntington Park

OKLAHOMA
Oklahoma City
Pawhuska
Seminole

TEXAS
Fort Worth
Odessa
Snyder
Houston
Sundown
Wichita Falls
Quitman

NEW MEXICO
Hobbs

KANSAS
Chase
Russell

ILLINOIS
Grayville

ARKANSAS
Magnolia

COLORADO
Rangely

Standard of Excellence *Since 1920*

Sargent

ENGINEERING CORPORATION
2533 EAST 56TH STREET
HUNTINGTON PARK, CALIF.

"Good will" is the disposition of the pleased customer to return to the place where he has been well treated.
—U.S. Supreme Court

BUILDS PUMPS THAT BUILD GOOD WILL

Duncan to Represent Harbison-Fischer

M. O. Duncan has been appointed sales representative for the Ardmore, Okla., area for Harbison-Fischer Manufacturing Co. of Fort Worth. Before joining the subsurface oil-pump firm, Duncan was associated with the pump departments of the old Jarecki Manufacturing Co., Mid-Tex Supply Co., and Jones Equipment Co.

Bovaird Advances Ayers and Batchelor

Appointment of Roscoe G. Ayers to vice president and general manager and Raymond E. Batchelor to vice president and sales manager has been announced by Davis D. Bovaird, president of the Bovaird Supply Co. of Tulsa.

R. G. AYERS

R. E. BATCHELOR

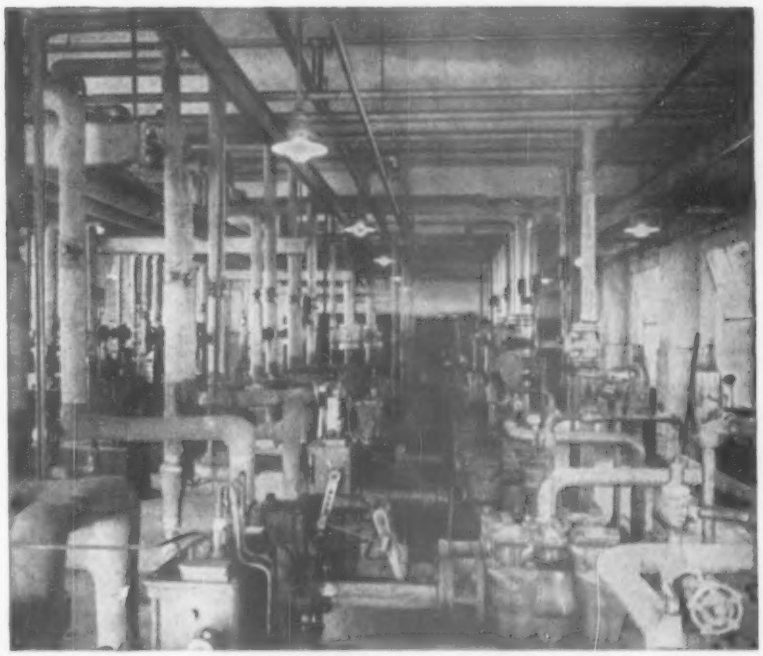
Ayers and Batchelor are both directors of the company and each has had 30 years or more experience in the manufacturing and distribution of petroleum equipment and supplies.

Batchelor is also vice president of the Bomud Co. This is a joint venture of the Bovaird Supply Co. and Mud Products, Inc. It was formed to distribute drilling muds and chemicals throughout the midwestern oil states.

Heacock to Direct Axelson Engineering

Appointment of Roy C. Heacock as director of engineering has been announced by W. W. Greenway, vice president and general manager of Axelson Manufacturing Co., a division of U. S. Industries, Inc. Heacock will be in charge of engineering covering all Axelson machine-tool, petroleum-equipment, and aircraft products.

Heacock has for the past 8 years been with Barber-Green Co. where he was vice president and director of en-



ENGINEERED PROTECTION

To Lick Fire—Maintain Profits!

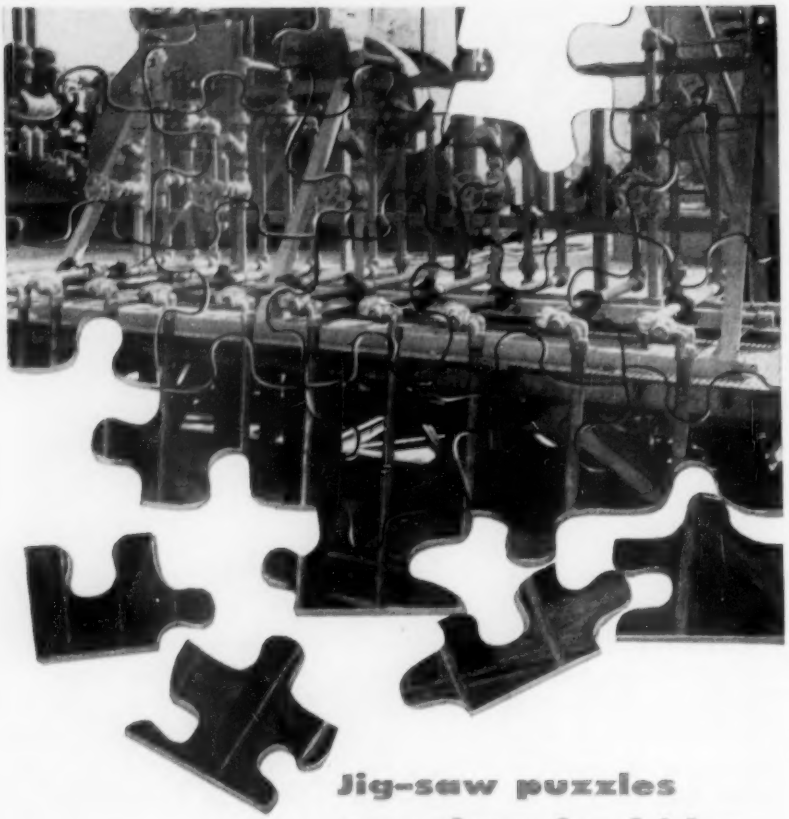
Close inspection reveals much more than meets the eye in this petroleum refinery pump room. "Automatic" FIRE-FOG protection, ENGINEERED to this specific risk, is ready at all times to detect and extinguish fire, should it threaten to destroy property, halt production, reduce profits.

This is but one type of a wide variety of fire-fighting systems designed, manufactured and installed by "Automatic" Sprinkler Corp. of America. Others employing AIR FOAM, high or low pressure CO_2, Dry Powder, etc. stand guard over scores of petroleum and petro-chemical properties throughout the world.

The time to plan ENGINEERED "Automatic" FIRE PROTECTION is **before** fire strikes—not **after** fire has destroyed. Contact your nearest "Automatic" Sprinkler fire protection engineer for an appointment with a Safety First future. He'll gladly prepare a fire protection analysis for you without cost or obligation.

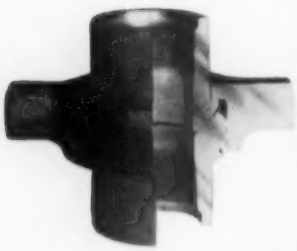
"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO

Offices in Principal Cities of North and South America



Jig-saw puzzles are okay for kids—

but not for a rig hook-up!



Every time you use several different make unions on the same rig you are piddling with a costly jigsaw-like puzzle.

It's a time-consuming, labor-wasting game of searching, matching, mating—and hoping—the different unions will fit.

In today's highly competitive oil business time wasted is money lost. That's why thousands of oil men are finding **it is wise to standardize with WECO Unions.**

By standardizing with WECO Unions you save time, reduce costs, minimize errors, avoid misfit and makeshift connections. Because with WECO you always get the exact size, type and pressure union you need for every oilfield service.

PESA

US-SS

WELL EQUIPMENT MFG. CORP.

HOUSTON, TEXAS

fmc

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

WECO ®

gineering and manufacturing. Prior to this connection, he was with E. I. du Pont de Nemours and General Electric Co.

Otis Appoints Two At New Iberia and Odessa

Otis Pressure Control, Inc., Dallas, has announced two new appointments in its New Iberia, La., and Odessa, Tex., divisions.

Adam Williams has been named to

A. WILLIAMS

JOHN WALL, JR.

the sales department to work out of New Iberia. John Wall, Jr., has been appointed a service specialist and transferred to Odessa.

Williams has been with Otis since 1942. His previous assignment was as a wire-line specialist.

After time as a roustabout with Fortenberry drilling contractors, Wall went with Otis in 1948 as a wire-line helper in the firm's New Iberia branch. He has also worked as a wire-line specialist in the Brookhaven, New Iberia, and Lake Charles offices.

Hollingsworth Named to District Post By Lone Star

The appointment of J. M. Hollingsworth as sales manager for District 1 (comprising Dallas, Fort Worth and East Texas) has been announced by Walter T. Moreland, vice president, sales, of Lone Star Steel Co. R. R. Reed, sales representative, also has been assigned to the district offices which shortly will be opened in the Republic Bank Building.

Hollingsworth joined Lone Star's sales department in 1949. Since that time he has held various supervisory positions.

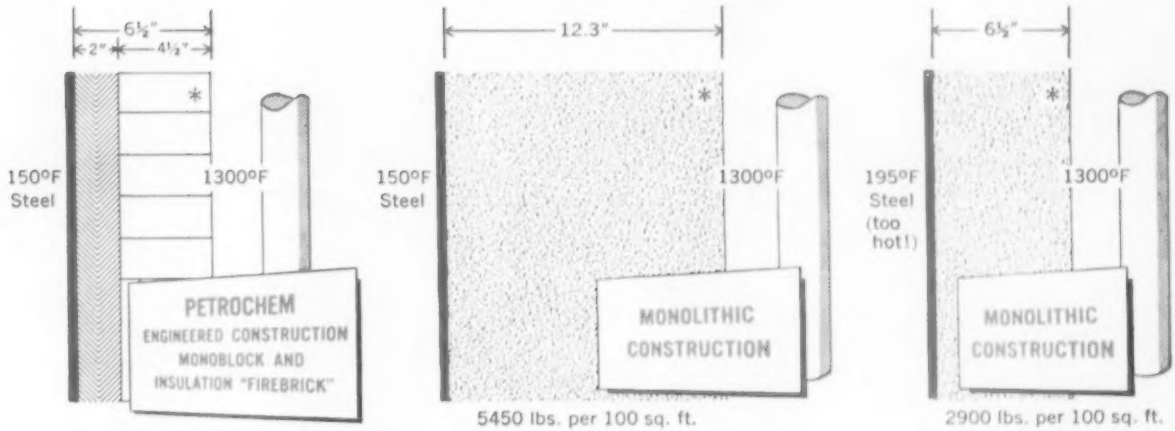
Lane-Wells Reclassifies Mid-Continent Stations

To provide better facilities and service for customers in the Mid-Continent division, four Lane-Wells truck stations have been reclassified to subdistricts. These include Okmulgee, Okla.; Pratt and Stockton, Kans.; and Henderson, Ky. James E. Clarke, W. J. Gray, J. B. Thompson, and Harold M. Bur-

In furnaces as in processes compare the design to judge the advantages

As an example:

The wall construction of all Petrochem-Isoflow Furnaces is designed for 150°F maximum outside shell temperature.



*Based on B & W values.

The Petro-Chem design provides a thoroughly engineered wall construction. It is built with two tiers of monoblock supported on 18 inch centers and a circular arched wall of insulating firebrick. The inside of the steel shell is protected from the possibility of corrosion by a one-eighth inch thickness of Staylastic cement. This type of construction, independently supported monoblock and the circular arch of firebrick, bonded with Smoothset mortar, assures optimum efficiency and minimum maintenance.

The use of monoblock and insulating firebrick laid as a circular arch provides many advantages over a one-piece monolithic lining, including:

1—Low weight, 2—Low heat conductivity, 3—High hot crushing strength, 4—Low expansion coefficient, 5—Resilient compressible backing, 6—Long life, 7—Nil maintenance.

Also, this construction has low heat storage capacity, speeds both heating and cooling. Its light weight requires less concrete foundations and steel supports.

Compare and your judgment will affirm
Petrochem-Isoflow Furnaces are Most Efficient by any Comparison

PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INC. • 122 EAST 42nd St., New York 17, N. Y.

Representatives: Bethlehem Supply, Tulsa and Houston • Flagg, Brackett & Durgin, Boston • D. D. Foster, Pittsburgh • Favilie-Lovally, Chicago • Lester Oberholtz, Los Angeles • Gordon D. Hardin, Louisville • Turbex, Philadelphia

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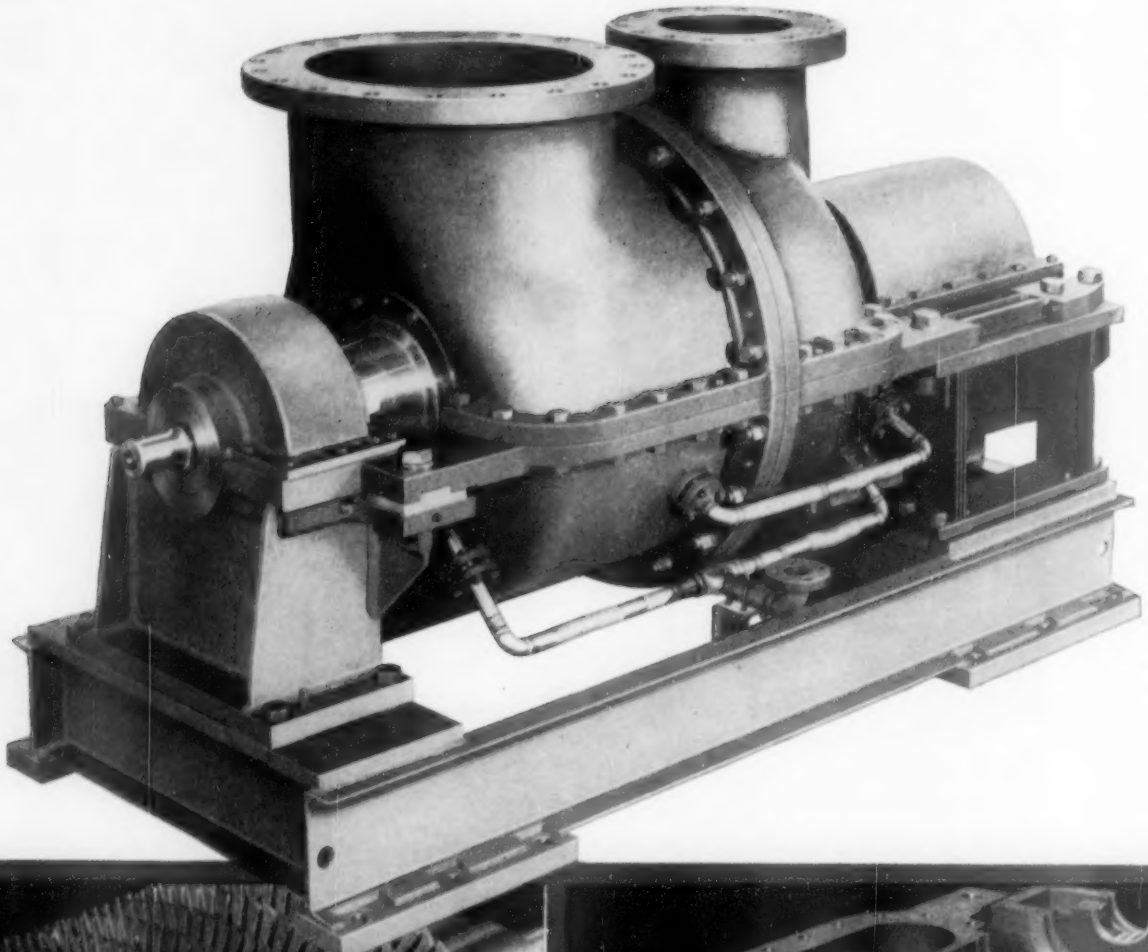
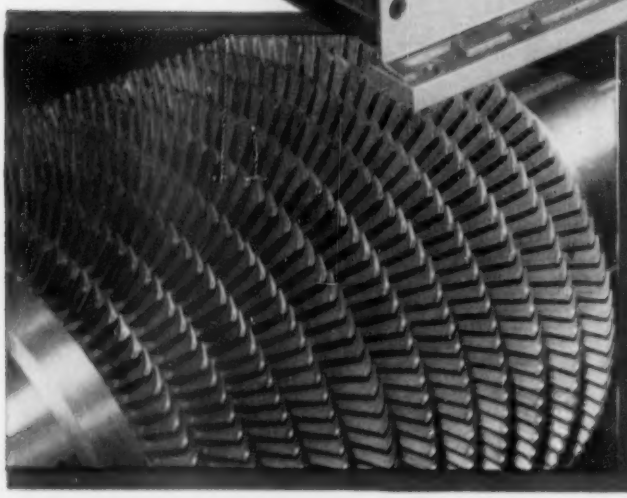
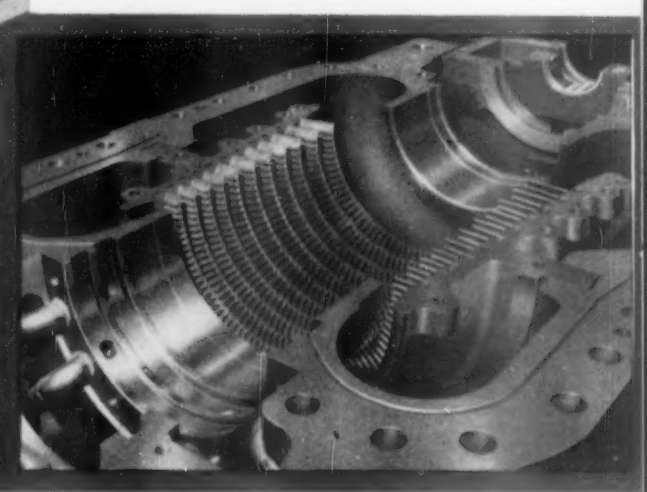
why let valuable hot gases go up the stack?







- Multi stages for minimum leaving losses.
- Twisted blades for maximum blade efficiency.
- Feather tip blades for close clearance — minimum inter stage losses.
- Bearings completely isolated from case.
- Stator blade carrier ring free to expand on guide pins in tongue and groove joint.

RECOVER WASTE ENERGY

here's how the new Clark Axial Flow Turbine puts waste hot gases to work

By expanding high temperature gases through the new Clark Axial Flow Turbines, up to 6500 hp can be recovered. Their conservative speeds permit direct connection, without gearing, to centrifugal compressors.

Built in two models, covering a 1500-6500 hp range, with inlet capacities of 3500-10,000 cfm, these highly efficient, specially designed, ultra simple Clark units can operate on gases with temperatures in excess of 1000 deg. F. They are ideally suited to use as recovery turbines in nitric acid plants, refrigeration cycles and, in fact, any place or process where there is a substantial volume of clean gases at moderate pressure and high temperature. Already, there are several in operation with more being built.

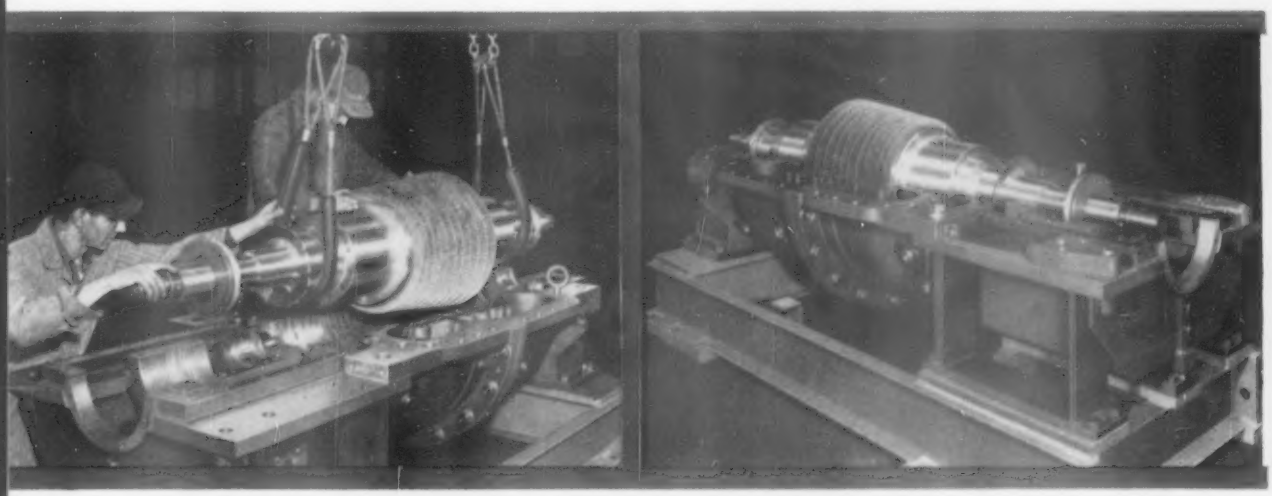
No longer need you confine your thinking to process temperatures under 1000 deg. F., because of a lack of suitable high temperature equipment. No longer need you throw away valuable heat energy. The new Clark Axial Flow Turbine may well solve your problems. Consult the nearest Clark office.

CLARK BROS. CO. • OLEAN, N. Y.

Offices in Principal Cities throughout the World

CLARK ® — ONE OF THE DRESSER INDUSTRIES

TURBINES
ENGINES
COMPRESSORS



- Rotor dynamically balanced for vibration-free operation.
- Simple, accessible design for easy maintenance.
- Generous diameter, stiff shaft, rotor design.
- Unique Clark thermo-elastic support.
- Free radial and axial expansion without misalignment and distortion.

Packaged. Mounted on a fabricated base and shipped as a complete drive assembly. Up or down connections.

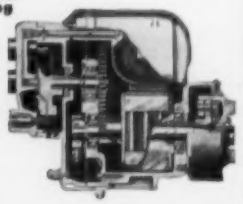
CONTINUOUS PUMPING ENGINE OPERATION DAY AFTER DAY

Change the present magnetos on your pumping engines to Fairbanks-Morse Super Spark Magnetos and eliminate costly ignition failures. Fairbanks-Morse Magnetos are tops in economical performance and dependability—proven by years of severe oil field service—built by Fairbanks, Morse & Co., manufacturers of superior products for over 120 years.

Switch to Fairbanks-Morse Super Spark Magnetos and forget about ignition failures. See your Fairbanks-Morse service station or distributor or write Fairbanks, Morse & Co., Magneto Division, Beloit, Wisconsin.

BUILT TO TAKE A BEATING

- Compact, rugged, self-contained unit—few working parts
- Sturdy impulse coupling of simple design for easy starting
- Alnico Super Magnets cast into powerful one-piece magnetic rotor
- Steady hot spark at all speeds
- Large, long lasting breaker points for quick starts—smooth performance
- Oversize high tension coils—built to take a beating



This is type FM-XOR six cylinder magneto with ball bearings throughout—available in base or flange mounting.

FAIRBANKS-MORSE

a name worth remembering when you want the best

MOTORS • ZC ENGINES • MAGNETOS • PUMPS • DIESELS

For Safety Unsurpassed

KELCO

Safety SPINNING LINE and BREAKOUT CATHEADS

The Model 16-LH Non-Fouling Cathead

THE OUTSTANDING CATHEAD OF TODAY AND TOMORROW

Anti-Fouling Catline Spool
Completely Housed Friction Cathead
Simplicity of Design, Operation and Maintenance
Double-Plate Clutch
Anti-Friction Bearings Throughout as Recommended by Leading Bearing Manufacturers
Choice of Mechanical, Hydraulic or Air Controls

AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE

Representatives in All Fields

EXPORT REPRESENTATIVE—Val R. Wittich, 30 Rockefeller Plaza, New York, N. Y.

Be Safety Wise — KelCo-ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

gener, respectively, are subdistrict superintendents.

C. D. Joslyn and Darrel E. Hout, district sales-engineer trainees at Casper, Wyo., and Henderson, Ky., respectively, have been promoted to district sales engineers.

New Construction Firm Organized in Tulsa

A new firm, Oil Capital Construction Co., headed by M. L. Roach, longtime industrial electrical equipment dis-

V. L. SNOW

S. J. LYON

tributor, has been organized in Tulsa. Verne L. Snow, vice president, is general manager. Steven J. Lyon is secretary-treasurer and John F. Y. Stambaugh is consulting accountant.

Both Snow and Lyon have wide experience in the oil construction field. Both were formerly with the J. B. Gill Co. Snow served the Refinery Engineering Co. as field engineer, superintendent, and estimator before joining the Gill firm as project engineer and manager. Lyon came to Oklahoma in 1952 as branch manager for the C. Wallace Co. for the construction of Stanolind Oil Co.'s Tulsa laboratory and the Sinclair Building.

Oil Capital is currently doing construction work in Oklahoma, Kansas, and Illinois. It plans to operate also in New Mexico, Texas, Colorado, Arkansas, and Missouri. It does both prime and subcontracting, specializing on small mechanical projects which large, nationally known contractors cannot do competitively.

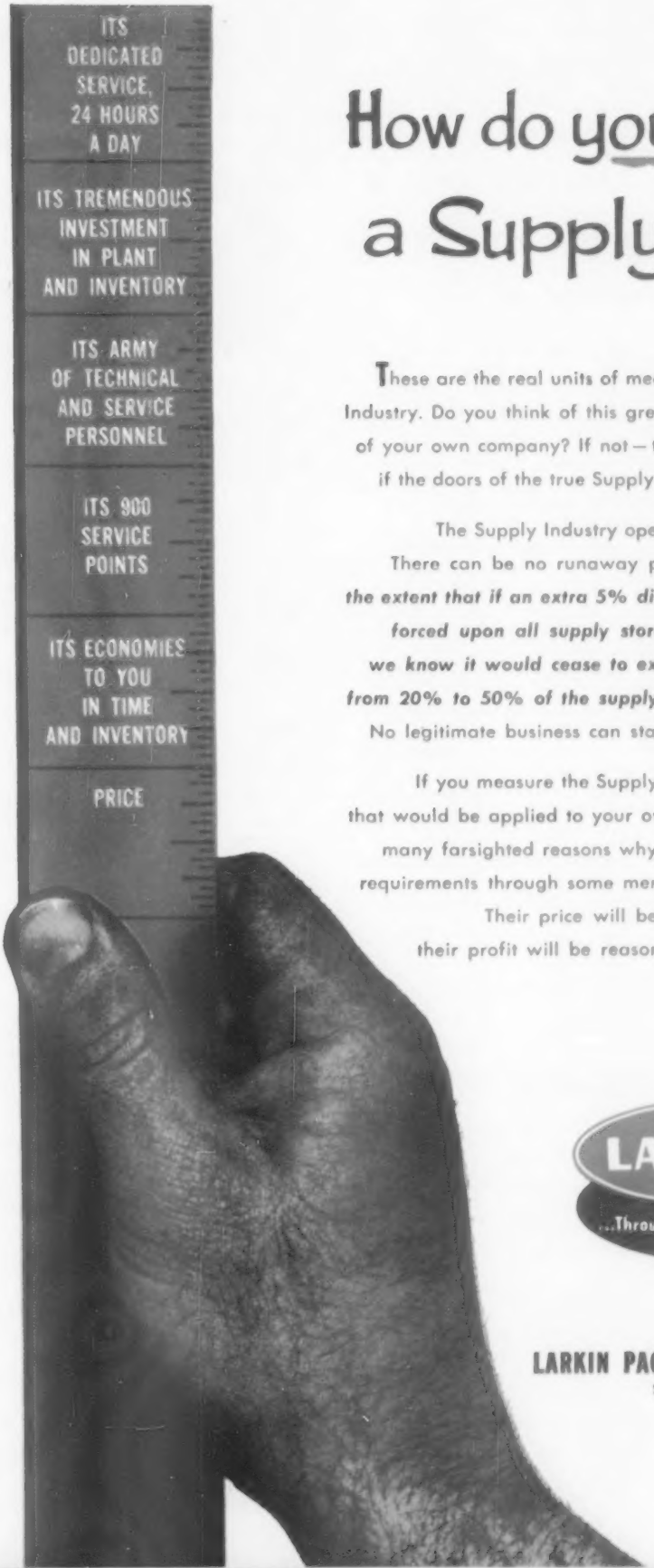
Rocky Mountain Export Moves Headquarters

The Rocky Mountain Export Co., Inc., Denver, has announced the removal of its offices to larger and better quarters on September 6, 1955.

The firm will be located in the New Carpenter's Building where there will be more convenient parking space.

In order to speed the handling of domestic calls and foreign messages, TWX-PBX and Telefax services have been installed.

Rocky Mountain Export represents some of the largest equipment manufacturers in Colorado and other states


ITS DEDICATED SERVICE, 24 HOURS A DAY
ITS TREMENDOUS INVESTMENT IN PLANT AND INVENTORY
ITS ARMY OF TECHNICAL AND SERVICE PERSONNEL
ITS 900 SERVICE POINTS
ITS ECONOMIES TO YOU IN TIME AND INVENTORY
PRICE

How do you measure a Supply Store?

These are the real units of measure for what is truly the Supply Industry. Do you think of this great industry as an integral part of your own company? If not—think what it would mean to you if the doors of the true Supply Industry were to close tomorrow.

The Supply Industry operates within a limited markup. There can be no runaway prices. ***The markup is limited to the extent that if an extra 5% discount were suddenly to be forced upon all supply store sales, the Supply Industry as we know it would cease to exist. That 5% discount represents from 20% to 50% of the supply industry's gross profit on sales.*** No legitimate business can stand such a reduction in profits.

If you measure the Supply Industry with the same yardstick that would be applied to your own business, you will find many farsighted reasons why you should purchase your full requirements through some member of the true Supply Industry. Their price will be honest—their profit will be reasonable—and well deserved.

LARKIN
...Through Your Supply Store

LARKIN PACKER COMPANY, INC.
ST. LOUIS, MO.

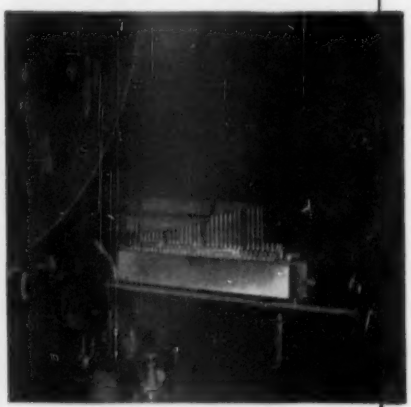
Manzel

FORCE-FEED LUBRICATION

Pressure Application—Exact Amounts—Accurately Timed

ENGINEERED TO THE SPECIFIC NEEDS

OF THE OIL AND GAS INDUSTRIES



Manzel Force Feed Lubricators in various models are available with from one to 30 feeds and for operation against discharge pressures of up to 30,000 PSIG. They can be engineered into your new equipment or installed on that already in service.

For dependable, automatic lubrication under pressure, Manzel Force Feed Lubricators deliver exactly the right amount of lubricant, to exactly the right places, at exactly the right times. They cut labor — reduce oil consumption — prevent costly breakdowns.

Manzel has had vast experience in meeting the specific needs of the oil and gas industries. When you have lubrication problems, call Manzel.

AND CHEMICAL FEEDERS, TOO

Manzel also produces Chemical Feeders with capacities from a few drops to 60 gallons per hour. Whatever your needs Manzel can fill them with equipment that is sturdily built, simply designed and completely dependable.

Manzel

Professionally qualified engineering representatives throughout the country.

DIVISION OF

HOUDAILLE-HERSHEY CORP.

336 BABCOCK ST., BUFFALO 10, N. Y.

for export sales management. Because Denver is becoming a more important export center, greater efficiency is required to handle foreign sales and shipments.

United Supply Appoints Brown as District Manager

The appointment of A. R. Brown as a district manager has been announced by United Supply & Manufacturing Co., Tulsa. Brown will have supervision of four United Supply stores in West Texas and three in New Mexico.

Brown began working in the oil fields in 1934 for Sinclair Oil & Gas Co. He later worked in Carmi, Ill., for another oil company.

Brown joined United Supply in 1944 as a floor man at the Oklahoma City store. He has worked in the Hutchinson, Kans., store and was made store manager at Seminole, Okla.—a position he held for 7 years. Brown was assistant district manager in the Ardmore, Okla., area before his recent appointment.

Kraemer Goes to Cooper-Bessemer Los Angeles Post

The appointment of W. H. Kraemer to the company's branch office in Los Angeles has been announced by Robert F. Lay, general sales manager of the Cooper-Bessemer Corp.

Kraemer spent several years in Cooper-Bessemer's compressor - engineering section before his first assignment to the concern's San Francisco office in 1950.

In his present capacity in Los Angeles, Kraemer will be responsible for the application of engine-driven compressors on pipeline operations, and in refineries and petrochemical plants.

Edward Names Stone Sales Engineer in Denver

Earl N. Stone has been appointed Edward sales engineer for Colorado, Utah, western Kansas, Montana, and Wyoming, as well as the Farmington, N. M., area, according to R. A. Durand, sales manager of Edward Valves, Inc., East Chicago, Ind., subsidiary of Rockwell Manufacturing Co.

In his new position, Stone's primary responsibility will be to introduce the Mudwonder valve for mudlines to the Rocky Mountain area. He will also handle the complete Edward line of

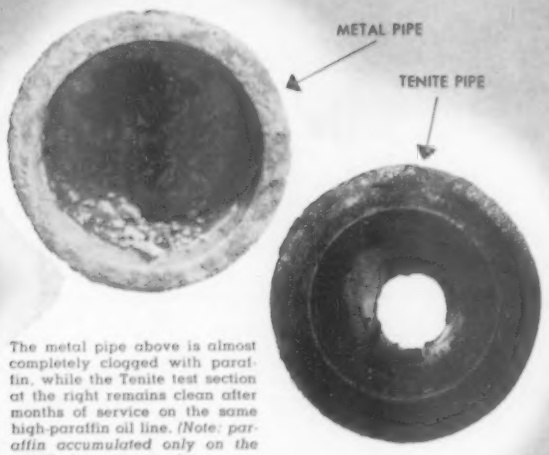
Butyrate pipe means less load on pumps

The low frictional resistance of Tenite Butyrate's smooth interior wall gives you up to 40% greater flow volume than does metal pipe for the same head loss.

Butyrate pipe means less maintenance

You can bury Tenite Butyrate pipe without corrosion worries. Tenite resists corrosion by sour crudes, salt water and electrolytic soils.

Butyrate pipe means less downtime



The metal pipe above is almost completely clogged with paraffin, while the Tenite test section at the right remains clean after months of service on the same high-paraffin oil line. *(Note: paraffin accumulated only on the metal pipe connector.)*

What problems could Tenite Butyrate lessen for you?

TENITE BUTYRATE PIPE ends many of the troubles you encounter with metal pipe. For example, using Tenite, you can quickly cross off corrosion failures. If paraffin accumulation has been your problem, you'll find that few, if any, cleanings are necessary when your paraffin-laden crudes are sent through Tenite lines.

Does your pipe have to be hauled over long, difficult distances? Then, you'll like the light weight of Tenite – it is only 1/12th as heavy as the cement-lined metal pipe you may now be using. Tenite even helps your pumping costs, lets you use smaller pumps and less power. Best of all, Tenite is the easiest pipe to install. You just solvent weld slip-sleeve couplings to the pipe ends.

Look into the record of Tenite Butyrate pipe in oil field service. Our technical staff will give you full information and help you adapt Tenite pipe to your operations. EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tenn., subsidiary of Eastman Kodak Company.

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE

Please send me information on TENITE BUTYRATE PIPE and a list of companies manufacturing Tenite pipe and fittings.

NAME .....

POSITION .....

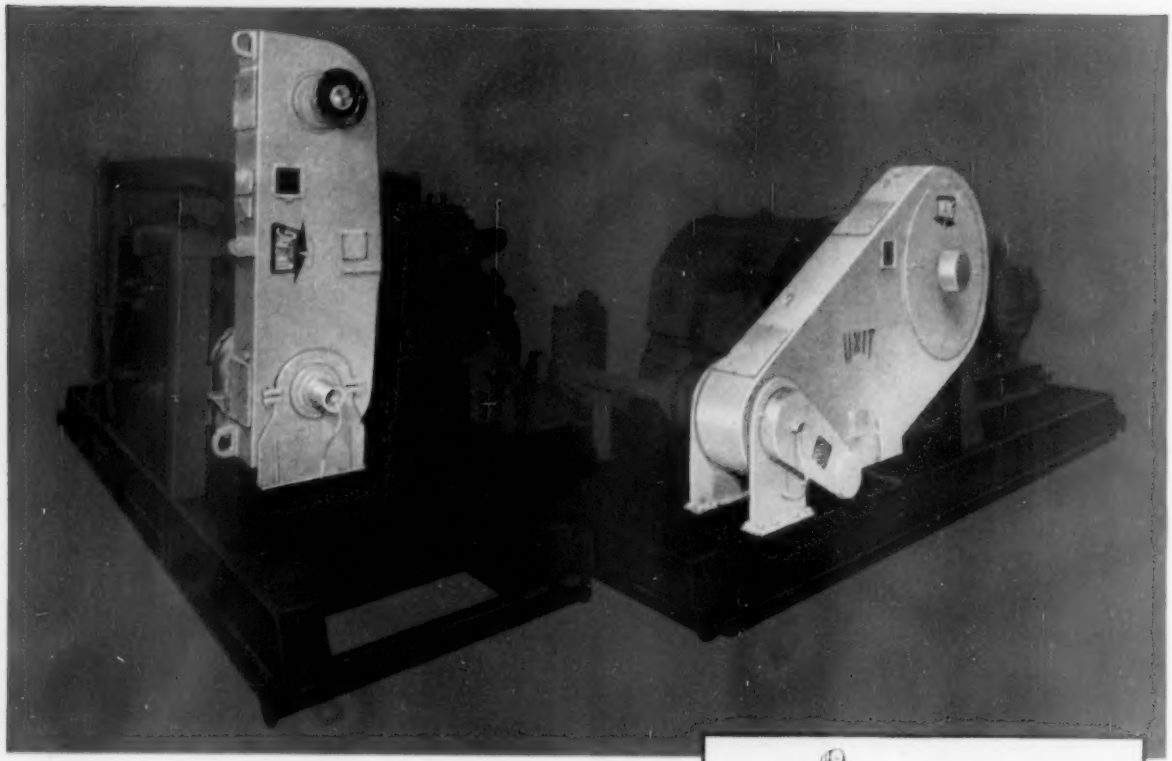
COMPANY .....

STREET .....

CITY ..... STATE .....

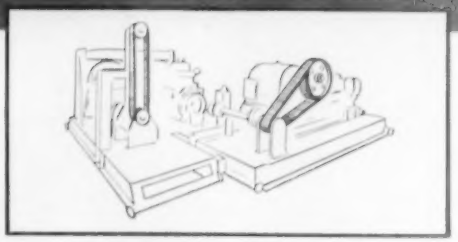
OG9-55

Unit Rig achieves flexibility, economy with Morse HY-VO Chain Drives



Unit Rig's Swinging Compound is a new type of power source, designed as a three-sectional unit with a swinging, compounding drive. Used with any combination of power, draw-works, and pumps, it is possible to move the sections without opening the case or breaking the chain. Skid-mounted elements can easily be separated and moved as units, one to a truck.

Morse HY-VO Drives, by request of the customer, were used on this special application of the Unit Rig Swinging Compound. A HY-VO Drive 6" wide x 1½" pitch is used for compounding the engines, while a HY-VO Drive 10" wide x 1½" pitch drives the pump.



Look Into These Morse HY-VO Drive Benefits:

- Longer service life
- Easy to install, assemble, and service
- Speeds up to 8500 fpm
- Transmits up to 5000 hp
- Saves weight and space
- Less vibration, less heat

Leading heavy-duty oil field equipment manufacturers depend on Morse HY-VO Drives to meet difficult requirements.

Investigate HY-VO for your own needs. And for other precision-built power transmission products, check first with Morse. MORSE CHAIN COMPANY, INDUSTRIAL SALES DIVISION, ITHACA, NEW YORK.

MORSE

BW

See distributor listings on opposite page

CHAINS, COUPLINGS, AND CLUTCHES

MORSE CHAIN COMPANY
BRANCH OFFICES AND REPRESENTATIVES

CALIFORNIA
Los Angeles
J. W. Minder Chain & Gear Co.
6011 South Central Avenue

San Francisco
Adam-Hill Company
244-246 Ninth Street

GEORGIA
Atlanta
Allied Companies
P. O. Box 328, Sta. A
740 Glenn Street, S. W.

ILLINOIS
Chicago
Morse Chain Company
325 West Huron Street

MASSACHUSETTS
Boston
Morse Chain Company
1105 Commonwealth Ave.

MICHIGAN
Detroit
Morse Chain Company
7601 Central Avenue

MISSOURI
Kansas City
Morse Chain Company
VFW Building, Room 702
406 W. 34th Street

Noelling Steel Sales Corp.
1517 Cherry Street

St. Louis
Bates Sales Company
1025 North Sixth Street

NEW YORK
New York City
Morse Chain Company
50 Church Street

OHIO
Cleveland
Morse Chain Company
421 Engineers Building

OREGON
Portland
Power Transmission Prod.
1107 N. W. 14th Avenue

PENNSYLVANIA
Bala Cynwyd
Morse Chain Company
9 Union Avenue

Pittsburgh
Morse Chain Company
Martin Building
119 Federal Street

TEXAS
Houston
Morse Chain Company
1312 La Branch Avenue

WASHINGTON
Seattle
Chain Gear, Inc.
820-824 First Avenue So.

WISCONSIN
Milwaukee
Morse Chain Company
5856 N. Port Washington Rd.

CANADA
Simcoe, Ontario
Morse Chain Company
385 2nd Avenue

Toronto, Ontario
United Steel Corp., Ltd.
58 Pelham Avenue

Vancouver, B.C.
Western Equipment Co., Ltd.
102 Main Street

DISTRIBUTORS

COLORADO
Denver
Union Bearing & Transm. Co.
1622 Wazee Street

LOUISIANA
Lafayette
Massart Tire & Supply Co.
211 W. 3rd Street
P.O. Box 553

Lake Charles
Behring's Bearing Serv. Co.
915-917 Third Avenue

Massart Tire & Supply Co.
1425 Broad Street

New Iberia
Voorhies Supply Co.

New Orleans
Sintes Sales Engineers
334 S. Diamond Street

Shreveport
Colossus Industries
213 Airport Drive
P.O. Box 71

OKLAHOMA
Oklahoma City
Turner Chain & Belting
1345 W. Main Street

Tulsa
Weiss Supply Co.
216 E. Third Street

PENNSYLVANIA
Pittsburgh
Pittsburgh Gage & Sup. Co.
3000 Liberty Avenue

Tranter Manufacturing Co.
105 Water Street

TEXAS
Beaumont
Behring's Inc.
1120 S. Fourth St.

Corpus Christi
C. E. Russell, Jr.
106 S. Chaparral
Box 1978

Dallas
Turner Chain & Belting Co.
2913 Canton Street

Fort Worth
Hall Bearing Co., Inc.
1304 Throckmorton

Houston
Behring's Bearing Serv. Co.
1308 LaBranch Ave.

Lubbock
M. B. McKee Company

Marshall
Power Supply Co.
305 E. Austin

Odessa
Turner Chain & Belting Co.
409 W. Murphy Street

Morse Chain Co.

Pecos
Navarro Supply Company

Port Arthur
Behring's Inc.
1749 Seventh Street

San Angelo
Electric Service Company
926 Pulliam Street

CANADA
Edmonton, Alberta
Electrical Industries, Ltd.
10544—115th Street

cast and forged-steel valves for service in steam-power stations, boiler-piping, refineries, chemical, and industrial plants.

Stone previously was employed as a sales engineer in the Denver area for Orbit Valve Co. of Tulsa. He will work out of Denver.

Bryant Is Named Baroid's Advertising Manager

C. A. BRYANT

Charles A. Bryant has been named advertising manager of Baroid Division, National Lead Co., it was announced recently by E. W. Louden, Baroid's director of advertising and publications. Bryant served for the last 5 years as assistant advertising manager of Mid-Continent Supply Co. Prior to that, he was advertising manager of the Dallas World and advertising production manager of the Wall Street Journal. He was assistant advertising manager of Butler Brothers for 1½ years.

Cooper-Bessemer Appoints Reagle New York Manager

The assignment of C. M. Reagle as district manager of Cooper-Bessemer's New York domestic territory has been announced by Stanley E. Johnson, Sr., vice president of the Cooper-Bessemer Corp., Mount Vernon, Ohio.

Reagle's new position will enable him to keep close personal contact with applications for centrifugal and reciprocating compressors in the New York area. He will be responsible for sales of diesel engines, gas engines, and gas-diesel engines in both the power-generating field and in the marine industry.

Reagle joined the original Bessemer Gas Engine Co. in 1922 and became a vice president and director in 1925. He was elected a vice president in 1929 when the Bessemer Gas Engine Co. merged with the Cooper company to form the present Cooper-Bessemer Corp.

Five Rector Men Get 20-Year Service Pins

Five members of Rector Well Equipment Co., Inc., Fort Worth, have been awarded 20-year service pins. They include L. L. Rector, president; C. W. Zartman, assistant to the president; M. C. Davis, sales representative in the Rocky Mountain area, with headquarters in Denver; C. L. Cron, chem-

Meet your **production**

EQUIPMENT SPECIALISTS

in **North Texas** *and* **North-Central Texas**

When you need equipment for your next well, call your Union Tank sales and service man. DAY OR NIGHT, his years of experience are available to you immediately. This service, combined with dependable Union Tank production equipment, means more profit to you. That's why it will pay you to know:

A. F. Nixon
Regional Manager
Fort Worth, Texas

H. R. Stoker
District Manager
Abilene, Texas

Keith McCarley
Branch Manager
Abilene, Texas

W. L. Musslewhite
Abilene, Texas

Floyd Womack
Branch Manager
Nocona, Texas

P. W. Alexander
Nocona, Texas

When your next well comes in, call Union Tank for fast, skillful service with dependable follow up on . . .

Welded steel tanks
Bolted steel tanks
Wood tanks
Stairways, walkways
Texsteam pumps
Vertical separators
Horizontal separators
Indirect heaters
Emulsion heaters
Heater tanks
Heater-treaters
Cold sep. & dehyd. units
Valves and regulators
Loading racks

UNION TANK AND SUPPLY COMPANY

P. O. Box 2092, Houston, Texas

Subsidiary of Butler Manufacturing Company
Kansas City, Missouri

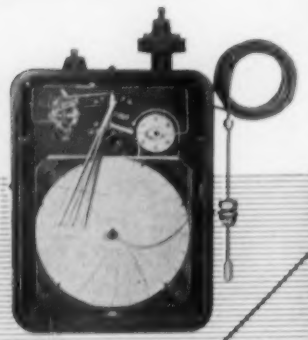
Meter Maintenance is SIMPLER... LESS COSTLY with American-Wescott Orifice Meters

Wherever precision measurement and economy of operation are required . . . at high or low flow rates . . . at varying temperatures . . . whether in recording, indicating, integrating or telemetering models, American-Westcott Series A-88 Orifice Meters are synonymous with accurate, dependable, trouble-free service and low maintenance costs.

American-Westcott Series A-88 standard mercury type orifice meters for working pressures to 5000 psi in interchangeable 10, 20, 50, 100 and 200-inch ranges give you complete versatility to meet any flow measurement requirements.

Recording • Indicating
Integrating • Telemetering

Write for full details.



Flow Recorder with 0-150°F. Standard Temperature Element.

CLEANING manometer body interior is easily accomplished through removal of high and low-side covers. Does not affect meter accuracy.

CALIBRATION is tamper-proof through simple, positive adjustment of float lever arm length.

EXTENDED HIGH SIDE chamber gives additional over-range protection — interchangeable without altering manifold piping.

MERCURY CHECK VALVES give positive shut-off for over-range protection.

TEFLON-PACKED STUFFING BOX is pressure tight, nearly frictionless, never requires lubrication, free from maintenance troubles.

TEFLON-PACKED PULSATION DAMPENER is externally adjustable under full line pressure.

Write your nearest American representative for your copy of the new Handbook E-2 based on AGA Report No. 3.

AMERICAN METER COMPANY

GENERAL SALES OFFICE: 1513 Race Street, Philadelphia • Albany • Alhambra • Atlanta Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City Los Angeles • Minneapolis • New York • Omaha Pittsburgh • San Francisco • Seattle • Tulsa

IN CANADA: Canadian Meter Company, Limited, Hamilton • Edmonton • Calgary

ist and manager of the Rectorseal plant in Houston; and W. P. Knight, manager of West Texas and East New Mexico sales district with headquarters in Midland, Tex.

L. L. Rector organized the company in 1930 to manufacture the casing head which he ultimately developed into the present Rectorhead.

U. O. P. Announced Four New Research Appointees

David W. Harris, president of Universal Oil Products Co., Des Plaines, Ill., has announced four new appoint-

DR. V. HAENSEL

H. S. BLOCH

ments to the company's research staff.

The new appointees and their positions are: Dr. Vladimir Haensel, director of refining research; Dr. Herman S. Bloch, deputy director of refining research; Dr. J. A. Chenicek, director of chemical research; and Dr. M. J. Murray, director of physics research.

J. A. CHENICEK

M. J. MURRAY

The new positions were created to further more effective coordination of research work.

Sperry Products Acquires Western Inspection, Inc.

Acquisition of Western Inspection, Inc., of Midland, Tex., by Sperry Products, Inc., of Danbury, Conn., is announced by Sperry President J. B. Farwell. Western Inspection will become Sperry Western, Inc., with offices remaining in Midland and Odessa, Tex., and Lake Charles, Lafayette, and New Orleans, La.

Western's James H. Binford continues as president, with Sperry's R. B. Manning as vice president and treasurer and D. W. Gordon as secretary and assistant treasurer. The board of directors will include J. B. Farwell,

Magcobar means more than mud alone...
it means...

THE INDUSTRY'S LARGEST PRODUCING FACILITIES

Stretching to all corners of North America, Magcobar production facilities have expanded year after year to provide the oil industry with an abundant source of drilling mud materials for the present and the future. To accomplish this steady production progress, Magcobar has reinvested a far greater percentage of its income in additional production facilities for the oil industry than any other mud company. The scope of Magcobar plants is shown in this composite drawing. All these resources are provided for oil operators so that wherever they drill, whenever they drill, they may be assured of the same high quality product. Look for the Magcobar Dealer sign when you need mud.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS

NOW- Available for HIGH PRESSURE SERVICE

VAREC

fig. 2500C

AUTOMATIC TANK GAUGE

Service in working pressures to 300 p.s.i.g. is offered by the new VAREC Figure 2500C Automatic Tank Gauge. It's a high pressure model of the successful VAREC Figure 2500 Series, equipped with the Neg'ator motor, which eliminates use of counterweight and simplifies installation. This series has been tested by 3 years of service in the Petroleum and Chemical fields, after 2 years of experimental and development work.

An important part of this new model is the magnetic drive, which requires no packing gland or mechanical seal on rotating shaft. The use of stainless steel ball bearing construction throughout provides a combination that reduces friction to a minimum.

Liquid level indication on a mechanical counter and dial for convenient, easy reading. Components are enclosed in a separate compartment to keep tank vapors from fogging dial. Operation checker is standard equipment.

All the field-tested, desirable features of the VAREC Figure 2500 Series have been incorporated in this new gauge for high pressure service — the Figure 2500C.

Varec

VAPOR RECOVERY SYSTEMS COMPANY
2820 North Alameda Street
Compton 1, California

961-9

Cable address: VAREC COMPTON Calif. (U.S.A.) All Codes

chairman, and J. H. Binford, R. B. Manning, and D. W. Gordon.

Sperry Products, Inc., has had 27 years of experience in research, engineering, and service in the science of nondestructive testing. Western Inspection was founded in 1949 to provide a service for the nondestructive testing of tubular goods in the oil industry. This combination of experience and research is cited by Sperry Western as offering its customers a more extensive testing service.

The acquisition is part of Sperry's program to expand its service through internal research, engineering, development, and acquisition of new products and services from outside sources.

Bovaird Announces Shifts In Top Sales Personnel

W. J. BOVAIRD

McCUISTION

William J. Bovaird has been promoted to general sales manager of stores and Thomas C. McCuistion to assistant to sales manager, it has been announced by Raymond E. Batchelor, vice president and sales manager of the Bovaird Supply Co.

Bovaird will supervise the company's store operations in Oklahoma, Kansas, Illinois, Texas, and New Mexico. He gained management experience at Russell, Kans., Odessa and Midland, Tex., and at Tulsa, where he has been assistant to general manager of stores for 3 years.

McCuistion will supervise operations of Bovaird sales offices at Tulsa, Houston, Dallas, and Denver, and will assist the district managers at Midland, Oklahoma City, and Wichita. He has been with Bovaird 20 years.

Graver Construction Names Two District Managers

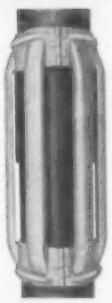
Martin H. Swanson and Frank D. Ahern have been appointed district construction managers for Graver Construction Co., Inc. Swanson has taken charge of the district office and equipment yard at Joliet, Ill. Ahern heads the new district construction base at Edge Moor (Wilmington), Del.

These facilities and similar centers in Houston, Tex., and Casper, Wyo.,

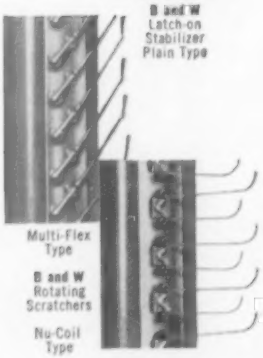
B and W SCRATCHERS and CENTRALIZERS

For a Good Cement Job

B and W Latch-on Centralizer with Kon-Kave Bow



B and W Latch-on Stabilizer Plain Type



First in the Field...

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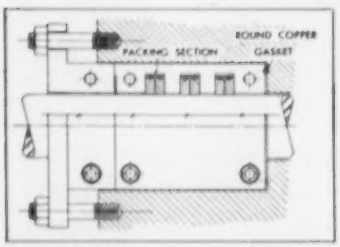
For air compressors, users report

GARLOCK SPLIT-CASE METAL PACKINGS

have 2 big advantages



1. **LONG, TROUBLE-FREE LIFE.** Minimum of 7 years with proper lubrication.

2. **CAN BE INSTALLED *WITHOUT* DISCONNECTING THE ROD.** Downtime is reduced to a minimum.

You can eliminate the cost of frequent packing replacements and unnecessary downtime by installing Garlock split-case metal packings on your reciprocating air compressors. Service reports show that these Garlock metal packings have given 15 years and more of trouble free service with a minimum of rod wear.

For complete information, call your Garlock representative or write today for Brochure 3889.

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Sales Offices and Warehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N.Y.), Philadelphia, Pittsburgh, Portland (Ore.), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS,

MECHANICAL SEALS, RUBBER EXPANSION JOINTS

serve as operating bases for construction personnel, tools, and equipment. From these centers, men and materials are sent out on both new-plant construction and plant-maintenance assignments.

R. D. Shaw, Dowell's Sales Consultant, Retires

Dowell Incorporated announced the retirement of R. D. Shaw, senior sales consultant. Shaw joined Dowell in 1932 and managed the company's sales department until 1953 when he became senior sales consultant.

Shaw came to Tulsa in 1933 to open Dowell's first sales office. At that time Dowell had 35 employes in Michigan, Oklahoma, Texas, Kansas, and Louisiana. Today there are 2,000 employes in 27 states, Canada, and Venezuela.

Magcobar Opens Office For Houston City Sales

Magnet Cove Barium Corp. has opened a city sales office at 727 Houston Club Building in Houston, according to John E. Lyons, sales coordinator for the company.

W. C. (Red) Rye, sales manager for the Texas-Gulf Coast division, and James C. Hewitt, sales representative, will be located in the new sales office.

Rector Announces Changes In Sales Organization

Rector Well Equipment Co., Inc., of Fort Worth has added new sales representatives and transferred others according to J. L. Pinkard, sales manager.

R. R. Rector, who started with the company 2 years ago as a sales representative in West Texas, has been transferred to Great Bend, Kans., as district representative.

J. I. Thomas has been appointed manager of the Corpus Christi district. He has been in the oil business since 1936 for oil and supply companies.

Paul Kittrell is now sales representative at Abilene, Tex., after 6 years with well-servicing and drilling companies.

T. C. McDonald has been trasferred to Shreveport. He has had 12 years with service and oil companies and 4 years as a sales representative for Rector.

J. I. Norton, after 6 years with serv-

100

portability + ruggedness

the LEE C. MOORE 100 Ft. two-trailer mounted mast

Designed for tougher portable assignments—the two-trailer rig arrangement permits the use of a larger mast, heavier drawworks and more power . . . and still retain the ultimate in portability.

The capacity of this new mast is equal to API derrick capacity of 350,000 lbs.

Horizontally retracting top section—reversible crown block. Unit is self-supporting—no guy lines required.

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RUST-BANS
will save you money

Check this list carefully.

Then check your own equipment; see if you have overlooked vital spots where RUST-BANS can help you save on maintenance costs.

Here are typical types and uses of RUST-BANS and other Humble Protective Coatings:

☐ ***Metal Primers:***
For priming all types of vessels and structures
For priming selected areas under highly corrosive conditions
For priming galvanized iron sidings and roofs of buildings

☐ ***Aluminum Coatings and Enamel Finishes:***
For finishing vessels and structures

☐ ***Hot Surface Coatings:***
For coating hot surfaces, like manifolds and exhaust stacks at temperatures up to 1000° F.

☐ ***Rust Preventive Compounds:***
For preserving stock inventories . . . items in bin storage
For protecting equipment in extensive outdoor storage . . . pipe and valves.

• *Call on the Sales Technical Service Division for expert advice on your corrosion problems. No obligation, of course.*

HUMBLE OIL & REFINING CO. P. O. Box 2180 Houston, Texas

HUMBLE

ice and supply companies, represents Rector in Lafayette, La.

Lloyd A. Davis is a new sales representative in Oklahoma City. He spent 8 years with supply companies.

William R. Singletary is new sales representative in Houston, after 8 years with various drilling, service, and equipment companies.

B-J Appoints W. E. Jensen Assistant Chief Engineer

Appointment of W. E. Jensen as assistant chief engineer of Byron Jackson Co. has been announced by Garth Nicholson, vice president and general manager.

As assistant chief engineer, Jensen will be located in the main offices in Los Angeles. He has been with Byron Jackson since 1951 and most recently was Mid-Continent field engineer out of Houston.

Pacific Pumps Names Watts To Manage New Office

Lee Watts will be in charge of the newly opened San Francisco office of Pacific Pumps, Inc., Huntington Park, Calif. The new office is located at 610 Balboa Building, 593 Market Street. Watts had formerly been with Pacific's Los Angeles district office.

O'Brien to Head Sales For Chicago Steel Tank

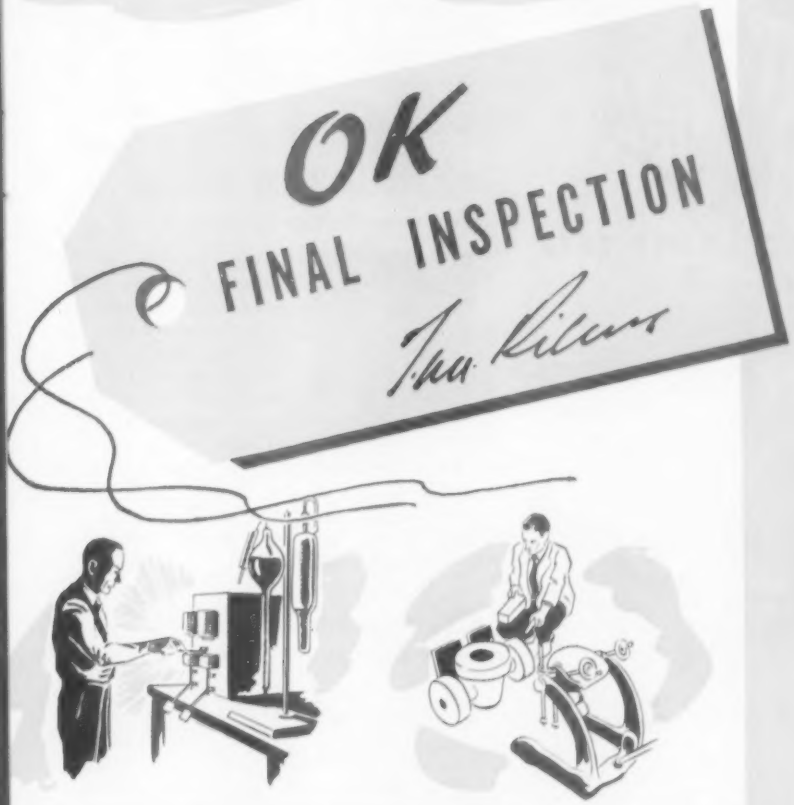
H. L. O'Brien has been appointed general sales manager of Chicago Steel Tank Co., a division of U. S. Industries, Inc., it was announced by Donald D. Cleghorn, general manager.

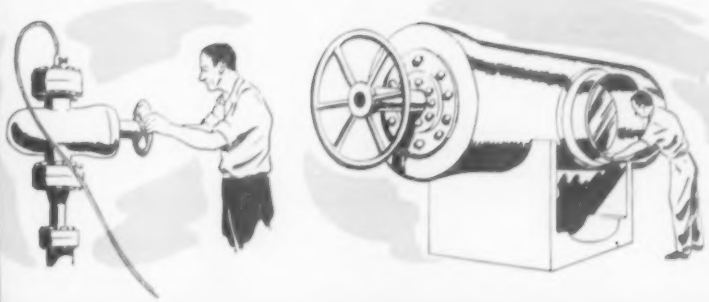
O'Brien has written numerous articles for trade journals on design and construction of pressure vessels. He is a member of the A.S.M.E. and is a registered professional engineer.

Wright Heads New Corrosion Control Firm in Tulsa

A new firm, Corrosion Control, Inc., Tulsa, has been issued corporation papers from the state of Oklahoma. Officers are Claude L. Wright, president; Walter E. Schott, Jr., vice president; and John E. Searcy, Jr., vice president.

Wright said the aim of Corrosion Control was to furnish corrosion-control engineering services to companies





W-K-M Valves

JUST LIKE INSURANCE

W-K-M's precise control of each step of the manufacturing process insures the excellence of every W-K-M Valve. Depending upon the size and the type of the valve, there will be over 300 separate inspections made on every single valve produced in the W-K-M plant. This is your assurance that W-K-M Valves will not only meet your most rigid specifications, but will provide trouble-free service for years to come.

Receiving Inspection

Raw Castings and materials received in warehouse are inspected for conformity to dimensional specifications.

Chemical & Metallurgical Analysis

Chemical and physical tests are run to determine conformity to ASTM specifications. In the case of some high pressure valves, the castings are inspected by gamma ray technique. Many other castings and materials are checked by magnetic particle methods to assure soundness of structure.

Manufacturing Inspection

All manufactured parts inspected for dimensional accuracy and finish. Also metallurgical and physical testing procedures are applied to maintain rigid control of these parts.

Testing

All valves tested 100% on high pressure test rack to test soundness of body and sealing at both seats.

W-K-M Manufacturing Company, Inc.

A subsidiary of ACF Industries Incorporated

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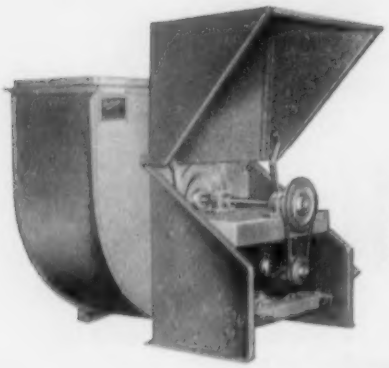
Get your air delivered at low cost in the handiest "packages" of all!



"Buffalo"

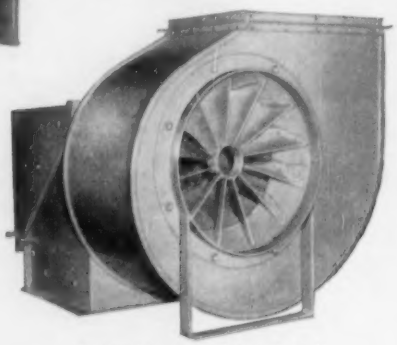
BELTED VENT SETS

Drive side of "Buffalo" Belted Vent Set furnished with hinged drive cover.

Indoor or outdoor installation! Available with this handy hinged all-weather drive cover and guard!

Adjustable capacity and no danger of overloading motor! Can be changed any time by adjusting sheaves — note adjustable motor bracket.

Convenient mounting flange plus lightweight, "package" design means economical installation for permanent or temporary use.



Inlet side of "Buffalo" Belted Vent Set showing inlet vanes.

VERSATILE! In 500 to 20,000 cfm capacities for small jobs where a quiet fan is desirable. Or for big jobs with a number of zones to ventilate, multiple-fan installations provide flexibility and economy over the large fan. Available in special construction such as access door in housing, non-ferrous everdur or aluminum wheel, explosion-proof motor, special protective coatings, high-temperature models for small induced draft service.

EFFICIENT, QUIET, STABLE PERFORMANCE is assured by "Buffalo" Inlet Vanes which minimize noise and turbulence—also by "Buffalo" backward curved blades and properly shaped housing scroll. In short, you enjoy the famous "Q" Factor of performance—the built-in Quality which provides trouble-free satisfaction and long life.

WRITE TODAY FOR BULLETIN 3702A for all details on these versatile packages!

"Buffalo"

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

operating pipelines, tanks and tank farms, refineries, gasoline plants, process plants, underground cables, both inland or offshore oil wells, heat-exchange equipment, and marine equipment.

At the same time, Wright announced the appointment of Walter E. Schott, Jr., as vice president in charge of sales. Schott has spent the past 5 years as a sales engineer in corrosion control.

John E. Searcy, Jr., has been appointed vice president in charge of engineering. Searcy has been active in engineering and developing corrosion-control practices for 8 years.

Otis Moves Frank Rhoades To New Iberia Office

Frank (Dusty) Rhoades, senior sales engineer for Otis Pressure Control, Inc., has been transferred to the company's division headquarters in New Iberia, La. Rhoades had been in the Corpus Christi division office prior to the transfer. Before joining Otis he was petroleum engineer with Union Producing Co.

Otis Appoints Three New District Salesmen

Robert B. McAmis, Charles C. LeMaire, and Mitchell Zampikos have been appointed sales representatives for Otis Pressure Control, Inc.

McAmis, now a sales engineer, will continue in the Houston area. LeMaire has been promoted to a sales engineer with headquarters in the Houma, La., division. Zampikos has been transferred to the sales department of the Corpus Christi division.

Scheibel Named Engineering Director of Otto H. York

The Otto H. York Co., Inc., West Orange, N. J., announced the appointment of Dr. Edward G. Scheibel as director of engineering. Scheibel's major responsibilities will be the design and development of chemical process equipment, emphasis being on extraction, distillation, and mist-eliminating equipment.

Scheibel joined York from Hoffman LaRoche where he completed 10 years, most recently as head of the chemical engineering department. Previously he was process-design engineer with both Hydrocarbon Research, Inc., and M. W. Kellogg.

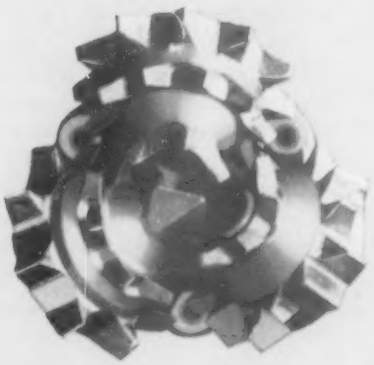
PERFORMANCE IN THE FIELD...

IS THE PERFORMANCE THAT **PAYS OFF!**

The true value of ANY drilling bit is determined *only* by performance in actual drilling service. That is why Globe places such great emphasis on field testing to prove the digging qualities of Globe Bits in the oil fields instead of merely estimating them in the laboratory.

Proof that Globe Performance "Pays Off" is constantly reflected by the increased use of Globe Bits throughout the world . . . 24% more Globe Bits were used in the first six months of 1955 than in the corresponding period of 1954.

GLOBE
2 and 3 Cutter Rock Bits, Regular and Jet Type Offer Operators Everywhere, a New Standard in Oil Well Drilling



Globe "SS3C" Jet Rock Bit

Globe "SS2C" Jet Rock Bit

GLOBE
OIL TOOLS COMPANY
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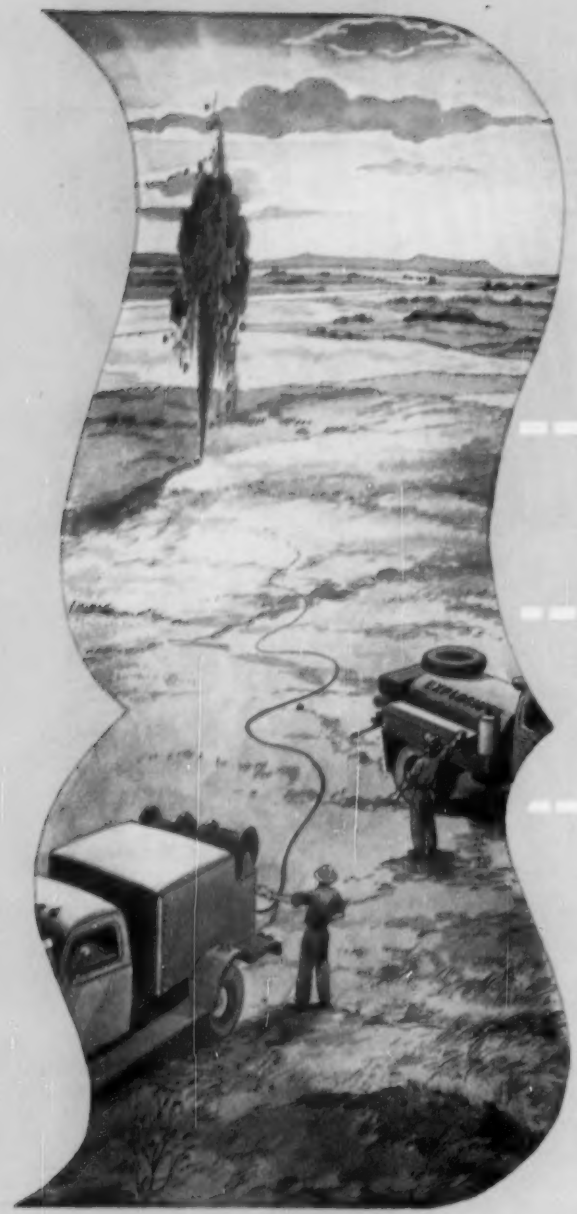
LOS NIETOS, CALIFORNIA
Branches in All Principal Drilling Areas

BE SURE TO VISIT GLOBE DURING THE A.A.O.D.C. CONVENTION



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OUR BASIC POLICY — and the foundation of our success — is men and equipment dedicated to the job.

Our men are thoroughly trained and widely experienced. In addition, they are loyal, conscientious and dedicated to their work.

Our equipment, too, is dedicated to the job, for it is built to meet the specific requirements of diversified conditions. Now, as in the past, we are pioneers in the development of numerous instruments and methods to obtain more accurate data most effectively.

Our men, equipment, and the background of 30 years of world-wide operations is threefold insurance for the success of your exploration program.

There is no substitute for experience which produces the real know-how in instrumentation, operation, and interpretation.

Petty GEOPHYSICAL ENGINEERING CO.

SAN ANTONIO 5, TEXAS

District Offices: Houston, Tulsa, Casper, Billings, Lafayette, Odessa

SEISMIC GRAVITY MAGNETIC SURVEYS

EXPLORATION

Rocky Frontiers Are Being Penetrated

by John C. McCaslin

WILDCAT frontiers in the Rocky Mountains are being attacked on all sides this fall. Exploration men are probing into the dry Chadron arch of Nebraska, the highly promising Paradox basin and adjacent Pacific Northwest Pipeline route areas; the Las Animas arch of southeastern Colorado; the sparsely tested Renville County, North Dakota, sector; scattered South Dakota counties, and in and around older producing areas of the Big Horn basin and Montana Plains.

The autumn oil-hunt agenda calls for a busy period of deep and rank wildcatting. Evaluation drilling of the new Muddy sand reservoir at Manderson in Wyoming and follow-up development in Phosphoria pool at Cottonwood Creek is due. All-important confirmation wells to recent gas and oil discoveries throughout the Rocky Mountains are slated. There is a cornucopia of important discoveries and tests scattered around the region, but two sections push all others aside in over-all importance. The busy Rocky Mountain operator has one eye on the western slopes, the other on Renville County.

Paradox stock rises . . . The Utah portion of the Paradox basin has added three new discoveries to its small but important coffers.

The most important new producing area is at Coalbed Canyon in San Juan County where Gulf Oil Corp. 1 Unit flowed 10,580 M.c.f. of gas per day with recovery of 120 bbl. of distillate reported on a 26-hour test of the Paradox-Pennsylvanian at 5,762-5,805 ft. Location has been staked for the second well on this unit.

North of Gulf's discovery White Canyon Mining Co. is waiting on cement at its indicated gas discovery, also in San Juan County. Gas shows are reported at the confirmation well in this area. Northwest of Coalbed Canyon Unit, Reynolds Mining Co. is preparing to perforate at another indicated gas discovery. All gas shows in this region have been from the Paradox-Pennsylvanian, a relatively new producing horizon for the Rocky Mountains (first discovered at Desert Creek by Shell last year).

Across the line in southwestern Colorado three new locations have been announced for Mesa and Montezuma counties. One is slated for the Fruita area, one at Point Lookout, and the other at Dove Creek.

Sohio Petroleum 1 Ritter in Renville County, North Dakota, more than 30 miles from production, appears to be the discovery of the year for the Williston basin.

The search for gas on the route of the Pacific Northwest Pipeline is paying off. Six recent discoveries plus 20 active locations in Utah, 52 in northwestern New Mexico, 35 in western Colorado promise big exploratory things to come in the Paradox, San Juan and Piceance Creek basins and along the western slopes of the Rockies.

. . . Western slopes. Delta County recently got is first gas production. This Colorado county has had very little previous activity. Minerals Engineering Co. 1 Baker, 1 mile from Orchard City, flowed 2,300 M.c.f. of gas per day from the shallow Dakota-Cretaceous sand at 654-690 ft. To the northwest Great Basins Petroleum Co. tested 2,000 M.c.f. of gas daily at its Hunters Canyon extension discovery in Mesa County.

. . . Northwest Colorado. A new Weber (Pennsylvanian) gas discovery in Moffat County lends new exploratory interest to this region. Continental Oil Co. and Sinclair Oil & Gas Co. 2 Thornburg Unit recovered 3,000-4,000 M.c.f. of gas per day on test at 4,017-55 ft. in the Weber. The other tests also recovered commercial amounts of gas.

New Look for Williston

The Williston basin's most significant strike of 1955 looms at Sohio Petroleum Co. 1 Ritter in 23-163n-86w, Renville County, North Dakota. Sohio recovered 3,911 ft. of free oil in a 2-hour test of the Charles-Mississippian. Further tests are under way.

This rank wildcat is more than 30 miles west of nearest production in Bottineau County on Williston's east side. It is the first discovery in the vast expanse of wildcat territory that stretches from the Nesson anticline to the east margin of the basin. Very little drilling has been done in this remote area.

The Sohio discovery, which will go on down to the Lodgepole which produces in east-side fields, could well be what Williston basin operators have been waiting for. Discoveries and subsequent development on the United States side of the basin's eastern rim have been disappointing. Real commercial success at the Sohio discovery will rekindle some smouldering exploration fires in North Dakota.

Burke County prospect . . . About halfway between the Renville wildcat and Tioga field on the Nesson anticline, Calvert Drilling Co. recovered oil on a drill-stem test at 1 Ophseth, 28-161n-90w, Burke County.

Success at this wildcat would bring first discovery production to the county. There is some Tioga field production in the far southwest part of Burke County. The 1 Ophseth is 28 miles northeast of Tioga field. Calvert ran two drill-stem tests in the Mission Canyon recovering shows on both. The biggest recovery was 575 ft. of heavily gas and oil-cut mud at 6,360-6,400 ft.

Typical use of RACEBILT pipe in the oil country. Note flexibility which makes for ea installation in difficult terrai

Oil Men, Cut Costs With *Racebilt* INDUSTRIAL* Portable Line Pipe

for oil, water and gas

Oil men are saving thousands of dollars in time and labor costs with the revolutionary new RACEBILT aluminum temporary line pipe . . . the patented, quick-locking coupler makes stringing and coupling 10 times faster than with steel . . . RACEBILT pipe is light weight—three miles to a truckload . . . smooth interior walls cut friction loss for greater volume . . . designed for oil, water and gas with working pressures up to 500 p.s.i. (Couplers and latches will more than withstand bursting pressure of the pipe!)

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FIRST IN INDUSTRIAL ALUMINUM PIPE

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"Another fine product in the *Racebilt* Line of Aluminum Pipe for Industry"

DOG DAYS EXPLORATION

Deep-Water Oil Search Moves Out and Down

1. Farthest offshore production established.
2. Drillers moved 40 miles off the Louisiana Gulf Coast to the farthest point yet in the Gulf of Mexico.
3. "Mr. Gus" drilling a record wildcat 20 miles off the Texas Gulf Coast.

Deep Land Exploration . . . Depth Records Topple

4. Louisiana . . . 19,000 ft. and going down.
5. Tulip Creek (Ordovician) well in Grady County gave Oklahoma a new producing-depth record at 14,068-76 ft.
6. Devonian well in Lea County is New Mexico's deepest oil producer at 13,600-13,725 ft.
7. Humble Oil & Refining Co. to drill a 16,000-ft. wildcat 17 miles northeast of Eagle Pass, Tex. . . . The 1 Bandera will be the deepest ever drilled in Maverick County.

Spirited Oklahoma Drilling Campaign

8. West Short Junction (24 Hunton-Siluro-Devonian producers) . . . Grady County's hot spot is West Chitwood . . . Southeast Beaver County drilling spree is one of the exploratory tales of 1955. Three new Morrow gas and distillate fields promise a superheated play in the coming months . . . Basal Pennsylvanian activity in northern counties growing in discovery proportions . . . Simpson discovery returns Woods County to the wildcat fold.

Rocky Mountains-New Pools, New Pays, Moving Exploration

9. Second commercial discovery in pre-Cretaceous formations officially completed in the Denver-Julesburg basin.
10. First Muddy (Upper Cretaceous) production at Manderson, Wyo.
11. Return to the Paradox . . . Three new gas hits hike big basin's importance.
12. No. 2 for South Dakota?
13. Three-cornered Colorado oil-hunt.
14. Arizona gets its second gas-producing area.

Texas-Crocket and Mexia

15. First production from the Crockett (lower Saline Bayou) in line for Southwest Texas area.
16. A deep try pays off as "dry hole" produces from Jurassic-Cotton Valley on Mexia fault zone.

Gulf Coast-Louisiana Swampland, Lakeside, and Coastal Marsh Success Reigns

17. New deep field opened in eastern Iberia Parish's swamps . . . Lake Arthur field splitting its seams . . . Isolated gas-condensate discovery at Pointe Au Fer.

Pacific Coast-Beverly Hills, San Joaquin, Oxnard, and Another Try at Oregon

18. New fault-block pool added to Beverly Hills field . . . New lower Stevens oil pool opened ½ mile north of Kern County's Strand area . . . Californians watch Oxnard test.
19. Standard Oil Co. of California, with one dry hole behind it, will move in again for another whack at Oregon's possibilities as an oil or gas producer. The new attempt to crack open the dry state will be dug about 40 miles southeast of Princeville in Cook County.

Southeastern surprise!

20. New field in Alabama. Lower Cretaceous oil found in Mobile County. First discovery in state since Pollard in 1952.

Land and Water Wildcatting Is Rewarding as . . .

Drilling Moves 'Way Out and 'Way Down

by John C. McCaslin

DEPTH and distance took the leading roles on the August exploratory stage as the industry set new water and land records.

Deep Gulf Coast records . . . Gulf Refining Co. established record oil production 35 miles out into the Gulf of Mexico off Terrebonne Parish, Louisiana, to set a new offshore drilling-distance record.

Gulf's 1-B O.C.S. 0420 in Ship Shoal Block 154 area, about 65 miles southeast of Morgan City, flowed at the rate of 595 bbl. of 29°-gravity oil per day on ¼-in. choke. This Gulf discovery moves Gulf of Mexico production to its outermost point.

. . . Distance record. Phillips Petroleum Co. rigged up its first test on an

Total August Completions, Exploration and Development

	Total completions					Total wildcat wells					Active
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	operations
Alabama	3	0	0	3	15,807	3	0	0	3	15,807	5
Arkansas	80	33	0	47	291,705	25	6	0	19	119,346	51
California	191	116	8	67	1,070,696	54	5	0	49	349,406	231
Colorado	134	41	6	87	720,171	73	5	1	67	370,575	105
Florida	2	0	0	2	14,750	2	0	0	2	14,750	4
Illinois	327	178	0	149	742,599	56	4	0	52	120,279	470
Indiana	59	9	1	49	84,104	18	0	0	18	21,522	70
Kansas	462	236	21	205	1,651,347	85	14	2	69	339,936	420
Kentucky	171	60	20	91	260,588	49	6	2	41	68,439	175
Louisiana	304	182	27	95	2,119,604	64	17	3	44	605,323	373
North	136	92	10	34	416,099	23	3	0	20	120,897	71
South	168	90	17	61	1,703,505	41	14	3	24	484,426	302
Michigan	65	28	1	36	184,399	28	1	1	26	77,651	110
Mississippi	31	18	0	13	199,514	8	0	0	8	48,657	39
Montana	44	15	1	28	210,236	20	1	0	19	89,625	79
Nebraska	74	32	1	41	426,204	26	4	0	22	141,182	51
New Mexico	168	81	56	31	728,294	23	8	1	14	112,049	158
Northwest	55	0	52	3	242,395	3	0	1	2	22,424	52
Southeast	113	81	4	28	485,899	20	8	0	12	89,625	106
New York	34	15	1	18	60,054	4	0	1	3	18,054	19
North Dakota	21	10	0	11	140,041	9	1	0	8	49,882	32
Ohio	152	80	37	35	316,886	4	2	1	1	16,066	205
Oklahoma	830	493	41	296	2,530,117	76	12	2	62	297,667	1,104
Pennsylvania	22	1	18	3	79,046	0	0	0	0	0	73
South Dakota	1	0	0	1	7,901	1	0	0	1	7,901	1
Texas	1,819	1,161	49	609	7,956,336	451	75	13	363	2,264,926	1,350
North Central (7-B & 9)	698	415	4	279	2,195,626	183	27	2	154	665,139	366
West (7-C & 8)	459	384	3	72	2,538,909	66	18	2	46	340,816	450
Panhandle (10)	101	73	16	12	370,946	6	1	0	5	43,723	48
East (5 & 6)	88	39	2	47	458,054	44	4	2	38	234,623	87
Gulf Coast (2 & 3)	210	105	5	100	1,344,511	77	12	1	64	582,279	208
Southwest (1 & 4)	263	145	19	99	1,048,290	75	13	6	56	398,346	191
Utah	13	2	2	9	49,075	9	1	1	7	30,102	24
West Virginia	59	4	46	9	141,987	0	0	0	0	0	196
Wyoming	89	39	3	47	447,137	24	3	0	21	132,810	132
Miscellaneous	§4	0	1	3	3,408	4	0	1	3	3,408	¶9
Total August 1955	5,159	†2,834	340	*1,985	20,452,006	1,116	‡165	29	922	5,315,363	5,486
Total July 1955	4,671	2,661	317	1,693	18,869,996	1,085	180	34	871	5,181,555	5,883
Cumulative 1955	37,526	21,238	2,300	13,988	149,530,320	8,041	1,228	240	6,573	38,680,958	
Cumulative 1954	35,740	19,983	2,615	13,142	146,527,941	7,352	1,061	256	6,035	35,910,373	
Western Canada	345	243	19	83	1,634,487	86	21	7	58	476,913	
Alberta	205	153	18	34	1,140,347	32	6	6	20	268,670	
Saskatchewan	102	59	0	43	379,576	41	6	0	35	152,580	
Manitoba	35	31	0	4	87,629	10	9	0	1	28,728	
B.C.-N.W.T.	3	0	1	2	26,935	3	0	1	2	26,935	
Cumulative 1955	1,808	1,263	88	457	7,974,653	492	95	47	350	2,459,333	

*Incl. 62 service wells: Ark. 1, Calif. 2, S. La. 1, N. Y. 15, Ohio 1, Okla. 39, Pa. 1, W. Tex. 1, Tex. Gulf Coast 1. †Incl. 49 condensate wells: Ark. 1, Kans. 1, N. La. 1, S. La. 15, Miss. 3, Okla. 10, N. Tex. 1, Tex. Panhandle 1, E. Tex. 1, Gulf Coast 9, S.W. Tex. 6. ‡Incl. 15 cond. discoveries: Ark. 1, N. La. 1, S. La. 6, Okla. 2, N. Tex. 1, Gulf Coast 2, S.W. Tex. 2. §Incl. Idaho 3 (1 gas, 2 dry), Nev. 1 dry at 908 ft. ¶Incl. Ga. 3, Ariz. 1, Idaho 2, Nev. 1, Ore. 2.

expensive tidelands lease 40 miles from the Louisiana coast. The location for the Block 184 Eugene Island area wildcat is farther from shore than any well yet drilled in the gulf. The well is off St. Mary Parish, 12 miles south of nearest production in Blocks 128 and 129 of the same area.

. . . "Mr. Gus." The big mobile drilling barge of Glasscock Drilling Co. is drilling a record Texas tidelands wildcat 20 miles due east of Port Aransas in the gulf. The wildcat is the most distant offshore test off the Texas coast. Location for the Atlantic Refining and Tide Water test is in Block 726, a 5,582.96-acre tract of the federally owned portion of the tidelands.

Nearest production to the Texas offshore well is at Mustang Island and Fulton Beach. Exploration in the area indicates a salt dome to be present.

Back on shore . . . New depth records were established in South Louisiana, Oklahoma, New Mexico, and one is planned for Maverick County, Texas.

. . . Louisiana. Richardson & Bass 1 LL&E-Humble "L," Plaquemines Parish wildcat, is the deepest hole ever drilled in Louisiana. Early in July the well reached a total depth of 19,752 ft. Testing of deep zones were carried out in August. There were indications of production near the 18,500-ft. zone. If these perforations should prove productive the well should also become the world's deepest producing well, surpassing the Weeks Island production in Iberia Parish at 17,554 ft.

. . . Oklahoma. The Tulip Creek of Ordovician age gave the Sooner explorers their deepest oil production at Max Pray & Associates 2 Billy in Grady County's prolific Bradley area.

The well was drilled to 14,140 ft. It flowed 100 bbl. of oil in 2 hours on an initial flow test of perforations at 13,828-90, 13,941-56 ft. in the Bromide Ordovician sand, and from 14,-068-76 ft. in the Tulip Creek. All three producing intervals break Oklahoma's oil-producing record of 13,804 ft. set by Phillips in the same area. This Ordovician reservoir in Grady County is proving to be one of Oklahoma's biggest new reserves. It is estimated that recovery in the area will be 1,000,000 bbl. per well.

. . . New Mexico. Sinclair Oil & Gas Co.'s 1 J. P. Dean, 5 miles northeast of Lovington, surpasses by 68 ft. the record set in April by Cities Service Oil Co. 1 State AP, a Devonian producer at 13,542-13,657 ft. in Caudill field. The Sinclair wildcat flowed 1,580 bbl. of oil in 16 hours on ½-in. choke

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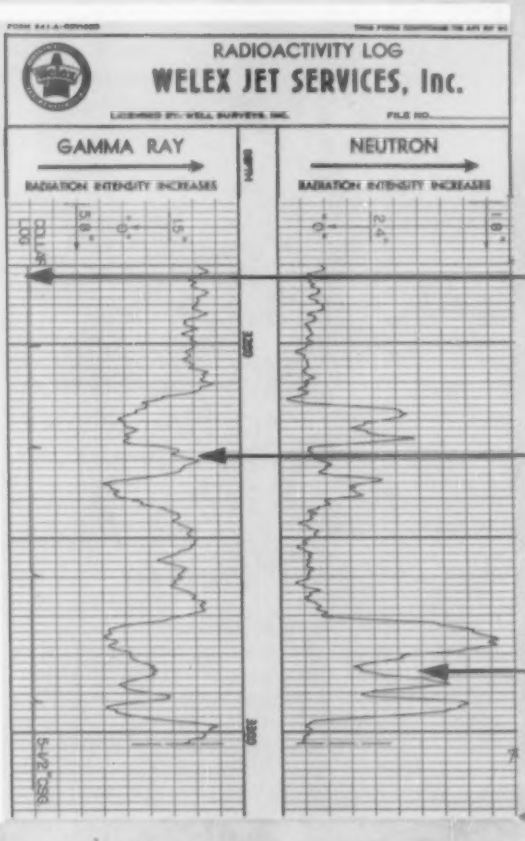

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The Gamma Ray Log gives you clear, sharp, repeatable definitions of the formations traversed in the borehole. Accurate location of the formation with the Gamma Ray Curve eliminates guess work in perforating and well completion practices.

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Total Depth Classifications, August 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	0	1	2	0	0	0	0
Arkansas	0	22	34	9	12	3	0	0	0
California	15	29	19	29	51	26	13	5	4
Colorado	1	1	12	28	87	5	0	0	0
Florida	0	0	1	0	0	0	1	0	0
Illinois	35	94	198	0	0	0	0	0	0
Indiana	22	32	5	0	0	0	0	0	0
Kansas	1	21	316	113	11	0	0	0	0
Kentucky	102	42	19	8	0	0	0	0	0
Louisiana	7	87	20	9	28	62	55	30	6
North	7	84	15	6	14	7	3	0	0
South	0	3	5	3	14	55	52	30	6
Michigan	6	27	11	15	6	0	0	0	0
Mississippi	1	1	0	3	19	5	1	1	0
Montana	0	13	8	5	7	9	2	0	0
Nebraska	0	0	3	8	63	0	0	0	0
New Mexico	3	29	55	27	34	12	7	1	0
Northwest	0	12	15	5	21	2	0	0	0
Southeast	3	17	40	22	13	10	7	1	0
New York	0	30	1	2	1	0	0	0	0
North Dakota	0	0	5	3	1	12	0	0	0
Ohio	44	42	62	3	1	0	0	0	0
Oklahoma	99	247	283	89	63	43	5	1	0
Pennsylvania	2	3	12	0	5	0	0	0	0
South Dakota	0	0	0	0	0	1	0	0	0
Texas	143	398	410	301	345	151	53	18	0
North Central	92	271	107	123	99	6	0	0	0
West	11	43	143	83	83	49	31	16	0
Panhandle	0	8	78	1	9	4	1	0	0
East	3	4	16	27	35	2	0	1	0
Gulf Coast	9	7	18	30	63	67	16	0	0
Southwest	28	65	48	37	56	23	5	1	0
Utah	2	5	0	1	4	1	0	0	0
West Virginia	2	37	17	3	0	0	0	0	0
Wyoming	6	9	15	14	32	9	4	0	0
Miscellaneous	1	3	0	0	0	0	0	0	0
Total August 1955	492	1,172	1,506	671	772	339	141	56	10
Total July 1955	414	1,128	1,200	588	781	339	148	68	5
Cumulative 1955	3,323	9,120	9,733	5,355	5,773	2,611	1,099	447	65
Western Canada	0	44	96	59	126	16	4	4	0
Alberta	0	18	26	22	124	12	3	0	0
Saskatchewan	0	8	54	36	2	2	0	0	0
Manitoba	0	18	16	1	0	0	0	0	0
B.C.-N.W.T.	0	0	0	0	0	2	1	0	0
Cumulative 1955	10	312	457	340	572	90	25	2	0

from perforations at 13,600-13,725 ft. The oil discovery is still short of the state's deepest gas production, the 1-A Bell Lake Unit, brought in by Continental at 14,940-15,025 ft., also in the Devonian.

Oklahoma campaign rolls on . . . 1955 will prove to be one of Oklahoma's most important exploratory and development-drilling years. All sections of the state are busy, particularly the Panhandle, the northern counties, the southern area, and the central counties.

. . . West Short Junction. Stanolind Oil & Gas Co. moved this fast-growing Cleveland County Hunton field to the northwest at 1 Roztocil. The big well flowed at the daily rate of 1,436 bbl. on ½-in. choke from only 5 ft. of lime perforations. The field is located just southwest of Oklahoma City.

. . . Northern activity. Northern Oklahoma is reawakening as an important discovery area for the state. Particular interest is concentrated in Grant and Alfalfa counties, and in a new Simpson area of Woods County.

A 15-mile-long basal Pennsylvanian (Bartlesville sand) gas-condensate area is shaping up along a trend running east-west through western Grant and eastern Alfalfa counties. Many of the new wells in the area are old workovers.

. . . Rank area opened. Southeastern Beaver County is the center of Hugoton embayment exploratory interest with three new far-from-production Morrow gas-condensate discoveries. The most significant strike is that made by Union Oil Co. of California at 1 Parker in the southern part of Beaver County. The big gas strike is 8 miles southwest of Southwest Camp Creek field, nearest production.

Big news in Paradox . . . The Paradox basin of southwestern Utah shifted Rocky Mountain interest. Three gas discoveries, one of them in Arizona, bring further hope to this new producing empire.

The top wildcat news of the summer in the region was made at Gulf Oil Corp.'s Coalbed Canyon Unit wildcat in San Juan County, Utah. The well, 15 miles southeast of Monticello, flowed gas at the rate of 13,900 M.c.f. per day with 22 bbl. of distillate. Production is from the Paradox-Pennsylvanian. To the north White Canyon Mining Co. made a similar discovery at 2 Sitton. Both wells are on the Pacific Northwest Pipeline route.

. . . Second Arizona well. Humble Oil & Refining Co. gave the Arizona portion of the Four Corners region its second gas-producing area. An Apache County wildcat flowed gas from the Pennsylvanian giving the state new hopes for increased gas production. This well, like the Utah discoveries, is on the route of the pipeline. It is located in the East Boundary Butte area and extends this gas field opened by Shell last year.

Other Rocky events . . . South Dakota may get its second oil pool at a wildcat prospect in Custer County, south of the Black Hills.

L. A. Helms swabbed 35 bbl. of oil per day from the Leo-Pennsylvanian

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Norman Vetters,
Drilling Superintendent,
Hi-Tower Drilling Co., Ltd.

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Mr. H. B. Wilson,
Manager,
Reed Roller Bit Co. of Canada Ltd.,
Lancaster Building,
Calgary, Alberta.

Dear Mr. Wilson:

To supplement our conversation of this morning, I thought you might like to have the following information on the string of Reed Super Shrink-Grip Tool Joints used on our Rig No. 5 now moving into Saskatchewan:

Type of Tool Joint:	Reed 4½" Full Hole
Purchased:	July, 1951.
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JWW/jb

Per: J. W. Wark
J. W. Wark,
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sand at the 1 Coffing, 18 miles north of Edgemont. The wildcat is considered to be on the extreme southeastern rim of the Powder River basin. The state's other oil pool is in the northwestern part of Harding County in the Buffalo area. That pool is considered a Williston basin producer.

. . . Manderson. The first Muddy production for the Manderson area of Big Horn County, Wyoming, was reported at Mobil Producing Co. F-14-12-G. Nearest similar oil and gas is 6 miles to the southeast.

. . . Colorado moves out. Rank wildcat locations were made in three corners of the state . . . Sedgwick County in the far northeast; Baca County in the extreme southeast; and in the Paradox basin area of Montezuma County in the far southwest.

"Firsts" in Texas . . . First Crockett production in Southwest Texas and a Cotton Valley strike on the Mexia fault zone captured Texas exploration prizes in August.

The Crockett discovery was made by Winn and Martin in Zapata County, 10 miles south of Bustamante. Limestone County along the Mexia-Talco fault zone in East Texas came up with a surprise Cotton Valley Jurassic gas strike. Zephyr Oil Co. made the hit at 1 Cannon Barron. Earlier in the year a Smackover discovery was made up the line at Mexia. Both strikes have far-reaching importance to East Texas exploration.

S.E.G. to Hold Annual Meeting in Denver

THE Society of Exploration Geophysicists will hold its Silver Anniversary, October 2-6, in Denver, with convention headquarters at the Shirley-Savoy Hotel. The program will feature papers on new field and laboratory techniques, geophysical case histories, safety in geophysics, and the application of geophysics to uranium prospecting.

Sunday, October 2, 1955

12:30-8:00 p.m.—Registration in the Lincoln Room of the Shirley Savoy Hotel.

Monday, October 3, 1955

8:00-12:00 a.m.—Registration in the Lincoln Room of the Shirley Savoy Hotel.

2:00-5:00 p.m.—Technical Sessions, Lincoln Room.

1. F. B. Wallis, "Report on Specialized Equipment—Canadian Operations."

2. R. C. Henderson (tentative), "Cold Weather Operational Hazards."

3. Arthur D. Darden, "Some Safety Aspects of Offshore Geophysical Operations from the Equipment Perspective."

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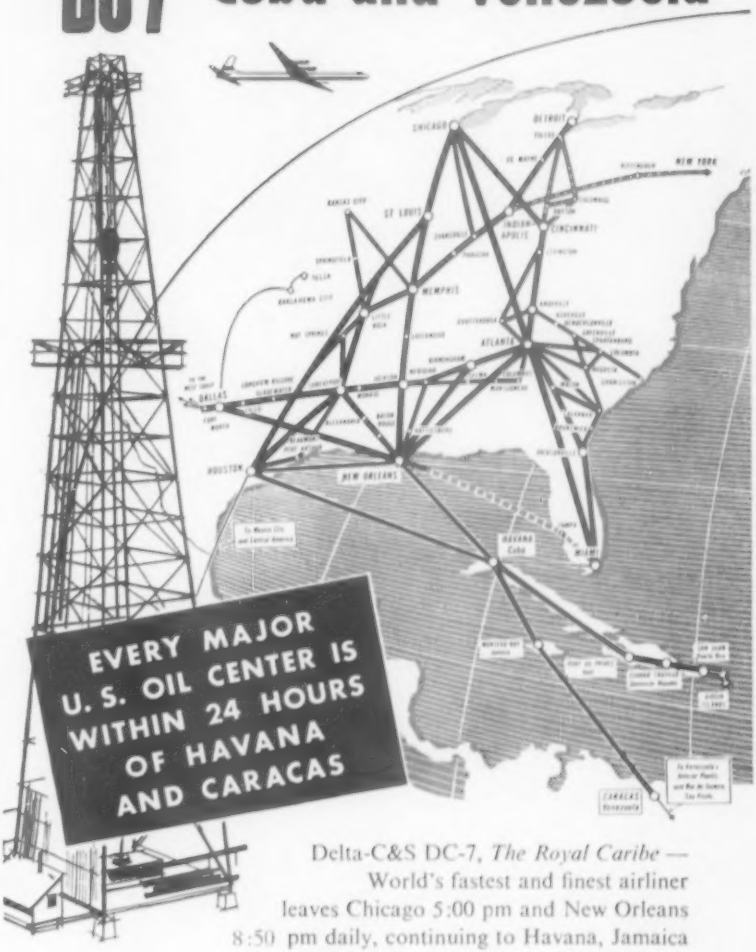

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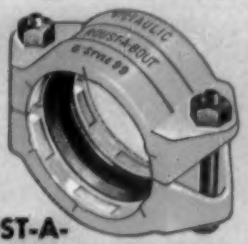

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5. L. F. Uhrig and F. A. Van Melle, "Velocity Anisotropy in Stratified Media."

6. G. M. Kintz & Associates—a demonstration, "Some Hazards of Static Electricity to Users of Electric Blasting Caps."

Tuesday, October 4, 1955

9:00-12:00 a.m.—Addresses, Honors and Awards, Lincoln Room.

1. Invocation—Rev. James B. Macelwane, S. J.

2. Welcome to Denver—Gov. Edward C. Johnson (tentative).

3. Featured Speaker—Herbert Hoover, Jr. (tentative).

4. Paul L. Lyons, Presidential Address.

5. E. A. Eckhardt, "The A.G.I. Serves You."

6. Sigmund Hammer, "Geophysical Activity in 1955, Interim Report to Midyear."

7. Milton B. Dobrin and Robert G. Van Nostrand, "Review of Current Developments in Exploration Geophysics."

8. Presentation of Honorary Membership.

9. Presentation of Student Paper Award.

10. Business meeting.

2:00-5:00 p.m.—Technical Session, Lincoln Room.

1. G. M. Knebel, "The Habitat of Oil in Sedimentary Basins."

2. George J. Blundun, "The Refraction Seismograph in the Alberta Foothills."

3. F. S. Kramer, "Alternative Modes of Seismogram Recording."

4. John Bemrose, "Recognition of the Effects of Diffraction in Exploration Seismology."

5. Fred Romberg, F. A. Van Melle, F. F. Reynolds, Robert Palmer, and Kenneth Burg, Symposium on Multiple Seismometers.

9:00 p.m.-1:30 a.m.—Dancing—Silver Glade Room and Century Room, Cosmopolitan Hotel.

12:30-1:30 a.m.—Breakfast—Century Room, Gun Room and Mezzanine floor, Cosmopolitan Hotel.

Wednesday, October 5, 1955

9:00-12:00 a.m.—Technical Session, Lincoln Room.

1. W. L. Fellows, "Geophysical History of the Oscurote Area, Anzoategui, Venezuela."

2. Raoul Vajk and George Walton, "Geological-Geophysical Case History of Parentis Area in the Bordeaux Basin of France."

3. T. A. Link, "Effect of Geological-Geophysical Discoveries in Western Canada."

4. Hugo R. Renden, "Majeau Lake, Alberta—A Discovery Resulting from a Restudy of Seismic Data."

5. M. C. Born (tentative), "Geophysical Comparisons at Dinuba, Tulare County, California."

6. G. A. Burton, "Geophysical Case History of the Good Hope Field, St. Charles Parish, Louisiana."

12:00-2:00 p.m.—Luncheon—Silver Glade Room, Cosmopolitan Hotel. Honoring Past Presidents and Charter Members and presentation of awards for 25-year memberships.

Special entertainment will be provided. Favors courtesy Kennecott Copper Corp.

2:00-5:00 p.m.—Technical Session, Lincoln Room.

1. Warren G. Hicks (tentative), "Interpretation of Velocity Logging to Exploration Problems."

2. J. S. Osaba, F. M. Perkins, Jr., and K. H. Ribe, "Resistivity of Sandstones as Related to the Geometry of Their Interstitial Water."

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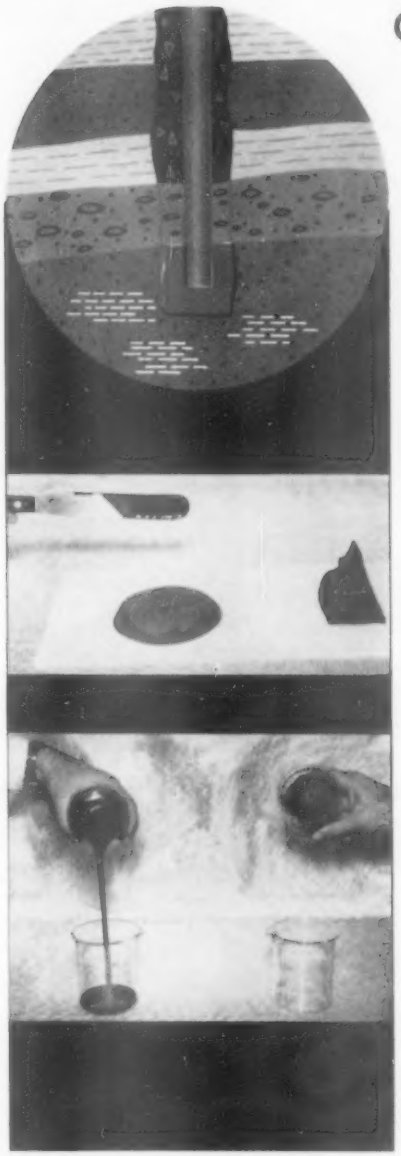

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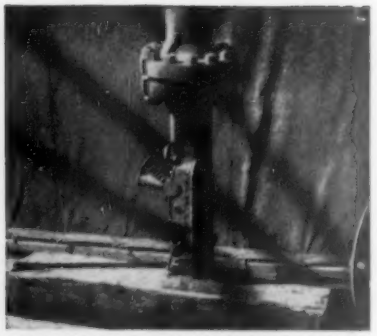

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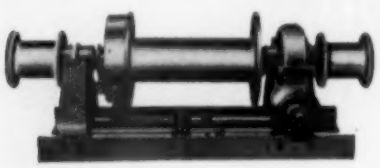

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3. R. H. Winn, "The Evaluation of Carbonate Reservoirs by Radiation Guard Logs."

4. Charles A. Hutchinson, "Theory of Digital and Analog Computers."

5. Thomas J. Bevan, "Geophysical Application of High Speed Digital Computers."

6. Dr. W. W. Garvin and J. W. Northrop, "Geophysical Application of Analog Computers."

8:00-9:30 p.m.—Symposium on Magnetic Recording.

Moderator: William T. Born.

Papers by J. D. Skelton, H. H. Moody, and J. H. Hidy.

Thursday, October 6, 1955

9:00-12:00 a.m.—Technical Session, Lincoln Room.

1. J. H. Deming and L. O. Daily, "Exploration History of the Block 12 Area, Andrews County, Texas."

2. R. A. Peterson, "Studies of Seismic Wave Generation by Explosives."

3. Norman Ricker, "Shooting in Sand."

4. F. J. McDonal, "Seismic Attenuation in Pierre Shale."

5. David G. Murcray, "A High Frequency Multichannel Recording System for the Study of Blast."

6. F. A. Van Melle, "Some Observations on the Outgoing Seismic Signal."

2:00-5:00 p.m.—Technical Session, Lincoln Room.

1. George V. Keller and P. H. Licastro, "Electrical Resistivity and Dielectric Constants of Sandstone and Siltstone Cores."

2. D. G. MacKay, "Theory and Application of a Dual Frequency Airborne Electromagnetic System."

3. L. W. Morley, "Regional Aeromagnetic Interpretation in the Pre-Cambrian Shield."

4. Roland G. Henderson, "The Graphical Calculations of the Total Intensity of Three Dimensional Bodies."

5. P. A. Rodgers and J. C. Hollister, "Terrain Anomalies in Magnetic Surveying."

6. Kenneth L. Cooke and Joseph W. Berg, Jr., "Regional Gravity Survey in Salt Lake and Utah Counties, Utah."

7. Isodore Zietz and John R. Henderson, "A Theoretical Map of the Basement in Indiana Derived from Aeromagnetic Data."

8:00-10:30 p.m.—Technical Session, Lincoln Room.

1. David S. Robertson (tentative), "The Blind River Basin."

2. P. E. Byerly and H. R. Joesting, "Regional Geophysical Studies in the Uravan District, Colorado."

3. M. E. Denson, "Geophysical-Geochemical Prospecting for Uranium."

4. L. C. Pakiser and R. A. Black, "Exploring for Ancient Channels with the Refraction Seismograph."

5. F. J. Davis, "Aerial Radiation Surveys for Uranium Prospecting."

6. Arthur Y. Sakakura, "Analysis of Air-Scattered Gamma Radiation from Thick Uranium Sources."

7. R. M. Moxham, "The Application of Semiquantitative Methods to Airborne Radioactivity Surveying."

Friday, October 7, 1955

7:00 a.m.—Field Trip—Geology of the Front Range foothills west of Denver, presented by the Rocky Mountain Association of Geologists.

Buses will leave the Union Bus Terminal, Broadway and Seventeenth Street promptly at 7:00 a.m.

Trip speakers—Dr. F. M. Van Tuyl and Dr. L. W. LeRoy.

Luncheon will be served the participants.

The field trip will end in the late afternoon at the Coors Brewery in Golden, Colo., (tentative).

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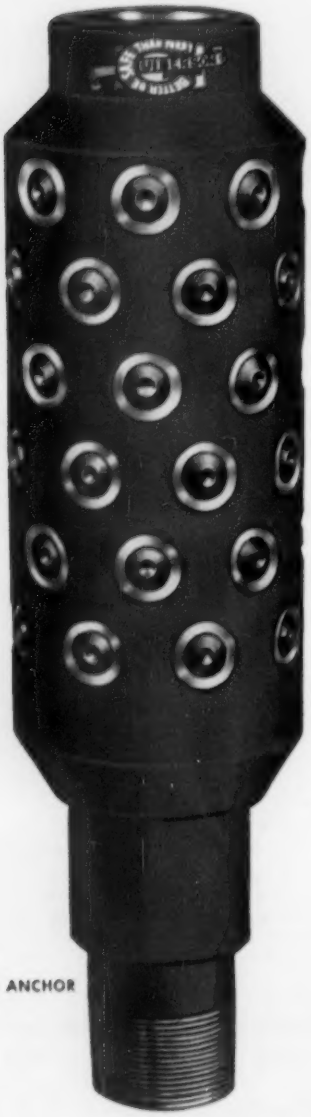

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EXPLORATION HIGHLIGHTS

ROCKY MOUNTAIN

FALL WILDCAT ROUNDUP

Widespread Exploration Promises Busy Autumn

Rocky Mountain exploration is shifting into high gear as the last quarter of a busy 1955 begins. Wildcatters are drilling all the way from the northern border of North Dakota down to the Colorado Springs area. New-pay discoveries and rank exploration top the oil-hunt program in the region.

New pays . . . One of the most important new-pay discoveries of the year in the Rocky Mountain province is McAlester Fuel Co.'s 7 Northern Pacific at Northwest Sumatra field in Rosebud County, Montana.

This discovery was completed for 83 bbl. of oil per day on 8/64-in. choke from perforations in the Piper-Triassic lime at 3,970-80 ft. This is the first such production in the area. Northwest Sumatra field produces from Amsden-Pennsylvanian dolomite and from three Amsden-Heath sands. The field is located on the Montana Plains.

. . . Rework strikes at Manderson. Two wells in Big Horn County, Wyoming's Manderson area, have been completed in the Muddy - Cretaceous sand. Both of Mobil Producing Co.'s wells, the F-14-12-G and the F-43-18-G, were originally taken to the Phosphoria-Permian, but were plugged back and completed in the Muddy sand for 96 bbl. of oil and 5,000 M.c.f. of gas; and 19 bbl. of oil and 1,480 M.c.f. of gas, respectively. Plans call for more Muddy wells in this area in an attempt to evaluate the new reservoir. This field is located on the eastern flank of the Big Horn basin. The new area is also 20 miles north of Worland.

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Walker-Neer manufactures well servicing winches, single or double drum, with or without spudding beams, in a complete range of models from 1000-foot to 8000-foot capacity. Like Walker-Neer Spudders, these units feature balanced drums, replaceable brake rings, and all ball or roller bearing construction. They are available both in conventional design with drum clutches on the clutch shaft, or with full floating drums.

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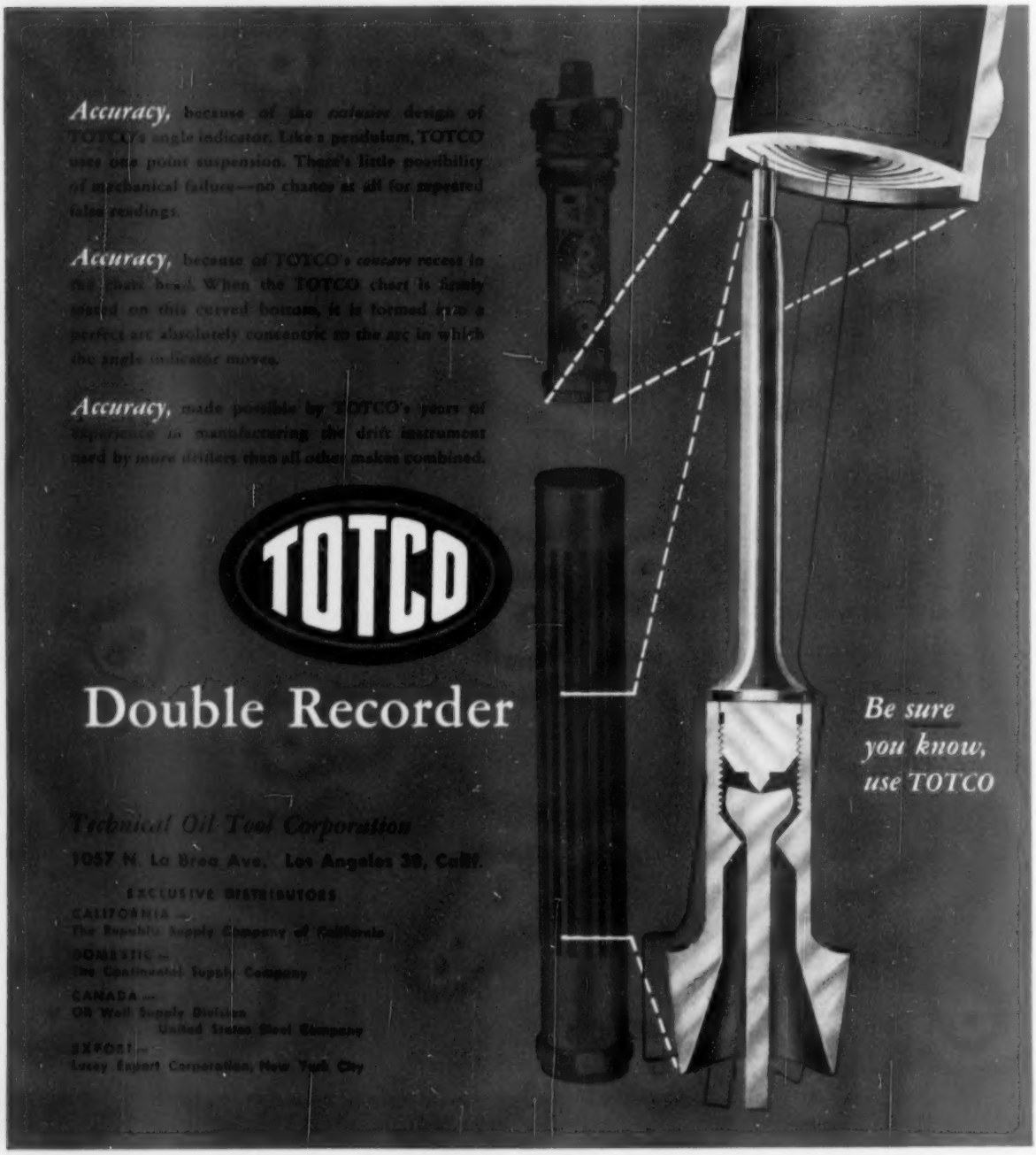
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Cotton Creek . . . Stanolind Oil & Gas Co. recently completed a big well at this Washakie County, Wyoming, field. The 4 Unit in C SE SE 7-27n-90w flowed 956 bbl. of oil daily on 24/64-in. choke from Phosphoria perforations at 5,552-55 ft. and 5,583-95 ft.

The discovery well at this unit, the 1 Unit in C SW SW 2-47n-91w, was finaled in 1953 by Stanolind for 188 bbl. of oil per day on the pump. The field is located on the southeastern flank of the Big Horn basin, southeast of Worland.

Deep Nebraska tests . . . Two important wildcats are going to the granite in Nebraska's Chadron arch region. Ohio Oil Co. 1 Bremer in C SW SW 5-7n-39w is drilling below the Cretaceous, and the 1 Ferrell, NE NW NE 25-18n-45w, Garden County, is below 4,900 ft. This new Chadron arch exploration is another step on the long road to possible production in this still-dry region.

Las Animas surge . . . Ten wildcats are drilling in southeastern Colorado. M. J. Stansbury 1 Cordes & Oberlander in Bent County, which opened Bents Fort field, set off the busy wildcat program in this section of the Rockies. That discovery was dually completed in the Pennsylvanian Atoka and Morrow sands as a gas and oil strike. It brought first production to the Las Animas arch. The new wildcats are located in Bent, El Paso, and Lincoln counties.

South Dakota strat-tests . . . Wildcat activity is at its highest peak in this state. Operators plan a number of tests for scattered western and central counties. Most of the tests will be of the strat variety. There are 14 wells planned for Meade, Pennington, Custer, Ziebach, Dewey, Walworth, and Fall River counties.

Three States Natural Gas Co., Coulston Drilling Co., and W. R. Gibson, Jr., tested 4,600 M.c.f. of Morrison gas per day at Cullen-Government in NE NE NE 15-20s-23e, Grand Countay, Utah.

NORTH DAKOTA

Magnetometer Survey of Keene Dome Available

The North Dakota Geological Survey in Grand Forks has available "A Magnetometer Survey of the Keene Dome, McKenzie County, North Dakota." The report is by Albert G. Opp. This survey was conducted during August and September 1954. The data were obtained with a Ruska Type V, vertical intensity magnetometer. Corrected station values were plotted on a base map and isogamma contours drawn. Producing oil wells, dry holes, and holes still being drilled were plotted on the same map to show the relationship between the magnetic anomalies and the oil fields.

WESTERN CANADA

New Quarterly Publication Of Maps Now Available

A new quarterly publication of maps showing oil and gas wells in Western Canada is now available from Nickle Map Service, Ltd., Calgary, Alberta.

The 37 maps cover an area of near-

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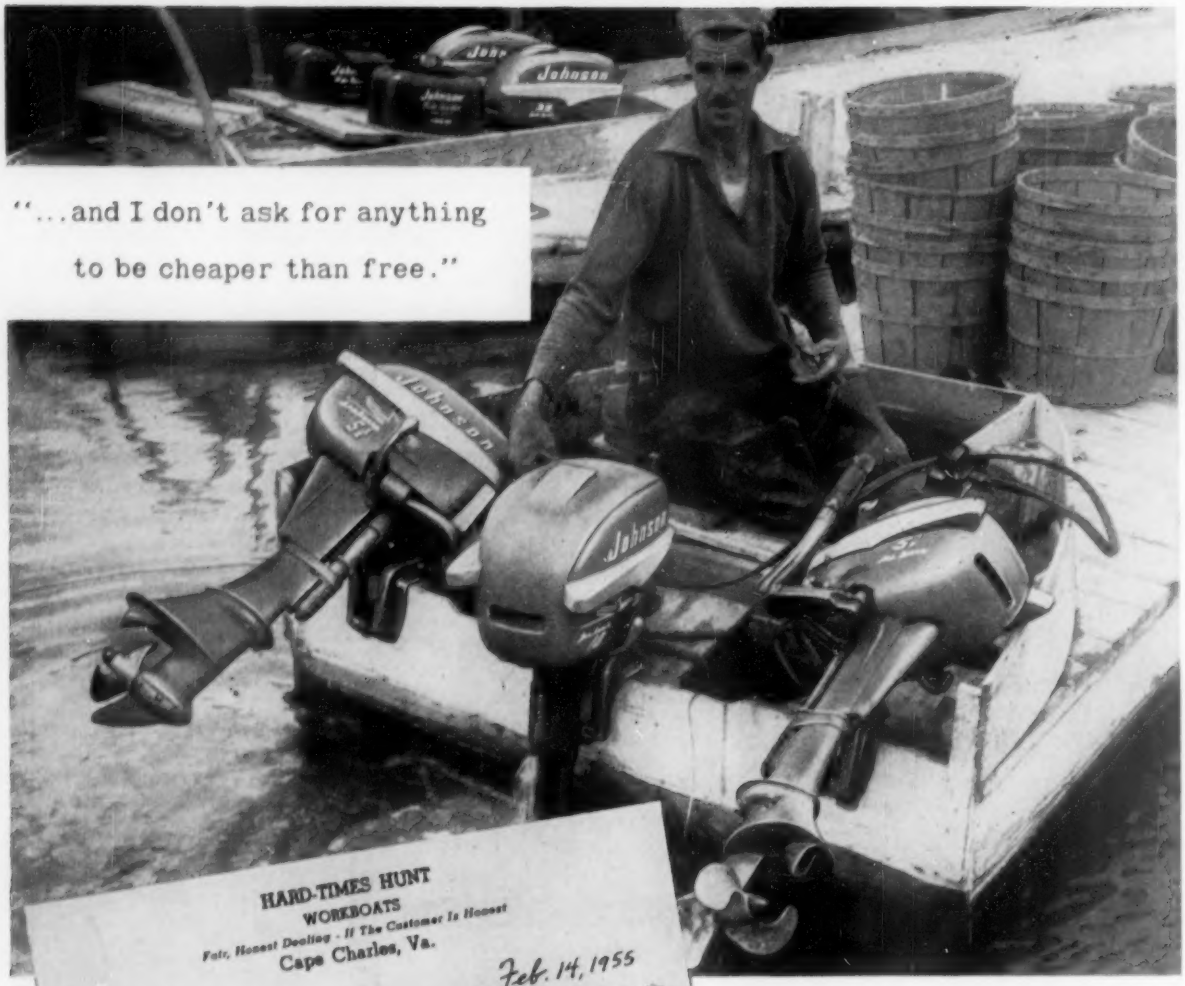

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I began to get some small outboards for the smaller boats, and found them so satisfactory that I now use outboards entirely and Johnsons exclusively.

During last year I bought six new motors (two 25's, two 10's and two 5's) for about $2,000, including insurance.

The two big motors propel a 40 ft. lighter, the two 10's are attached to a smaller lighter, and the 5's are used individually on 20 ft. scows.

This has been a rough winter—plenty of wind, snow and ice. The motors have been in use every day except when the ice was too thick to run through. During this past year, not one motor has failed to start and run—no time has been lost on the 10 mile run to market.

From accurate records, I find that the fuel and labor costs for this entire outfit are less than the cost of maintaining and operating a tow-boat, simply because self-propelled cargo boats and work scows can run to the beds cheaper than they can be towed by a larger boat and an extra man. I believe that the reduction in operating expenses and disposal of the unnecessary tow-boat has more than offset the amount spent for all six motors during the past year.

I anticipate that future economy, plus the high re-sale or trade-in value of Johnson motors, will maintain this little fleet in perpetual new condition, absolutely free, in comparison with other methods of propulsion—and I don't ask for anything to be cheaper than free.

Sincerely yours,

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Johnson SEA-HORSES FOR DEPENDABILITY

ly 400,000 sq. miles from Manitoba across Saskatchewan and Alberta to Northeast British Columbia and are on a scale of 12 miles to 1 in. These maps are reductions of the normal 4 miles to 1 in. Airsurvey Controlled Maps published by this pioneer Canadian oil mapping organization are intended to supplement regular office use of the larger scaled maps. The 4 miles to 1 in. maps are kept under daily revision.

ALBERTA

Campbell Creek Gas Well Completed in Falher Sand

The big gas discovery at Campbell Creek was completed last week for an absolute open flow potential of 33,000 M.c.f. daily from the Falher sand zone of the Lower Cretaceous.

Anglo-Canadian Oil Co., Ltd., 35-11 Campbell Creek, is 17 miles southwest of Grande Prairie and 235 miles northwest of Edmonton on LSD 11, 35-68-7w6. The gas sand contact was at 6,156 ft. About 32 ft. of pay was found in the discovery.

Gas Production Assured At Saddle Hills Test

The Saddle Hills wildcat 260 miles northwest of Edmonton in northwestern Alberta has been assured gas production. Royalite Oil Co., Ltd., and Canadian Fina Oil, Ltd., 6-3 Saddle Hills on LSD 6, 3-76-8w6, is 30 miles northwest of Grande Prairie. The gas zone is at 3,890 ft. in the Cadotte formation. Four drill-stem tests have been run in the gas zone.

Light Gravity Oil Found At East Chancellor Test

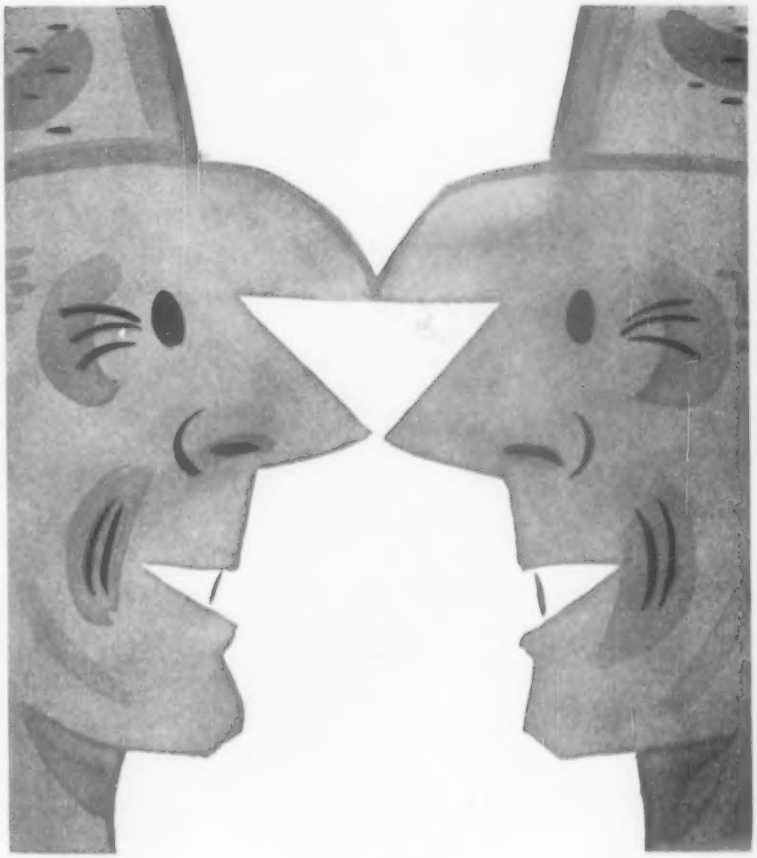
Mobil Oil of Canada, Ltd., recorded an encouraging show of light gravity oil during a straddle packer test at its 8-11 East Chancellor wildcat and is running string of production casing preliminary to further evaluation tests.

The indicated discovery, Mobil-CPR 8-11 East Chancellor is on LSD 11, 8-25-20w4, 25 miles south of Drumheller and 55 miles northeast of Calgary.

The find was made in the basal Quartz during straddle packer test of the interval 4,724-32 ft.

Tests Show Gas at Evarts Area Wildcat

Initial drill-stem test in the Mississippian zone at the Western Leaseholds Ltd.-Oilwell Operations Ltd. joint exploratory test the Evarts area of cen-



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tral-west Alberta showed a flow of natural gas. The team's well, Western-Oilwell 36-3 Evarts, being drilled on LSD 3, 36-37-3w5, is 3¼ miles southeast of wet gas discoveries in the area.

The result of the first drill-stem test in the formation showed a gas flow of 650,000 cu. ft. daily, recovery consisted of 150 ft. of mud. The second test also flowed gas but the rate was too small to measure. Pipe recovery on this test was 270 ft. of slightly oil and gas-cut mud.

Coring and testing below 7,000 ft. is continuing.

SASKATCHEWAN

Gas Discovery Reported At Cantuar Area Test

The team of Mobil Oil of Canada, Ltd.-Southern Production Co., Inc., and Woodley Canadian Oil Co. recorded a discovery of natural gas at its wildcat in the Cantuar area of southwest Saskatchewan. The strike was made in the Roseray sand formation at approximately 3,200 ft.

The well is known as Mobil-Woodley-Southern A33-6 Beverley; it is located on LSD 6, 33-15-16w3, 2¾ miles southeast of Cantuar medium gravity oil field and 14 miles west of Swift Current.

Drill-stem of the Roseray sand, recorded gas at maximum 7,114,000 cu. ft. daily. A slight spray of oil was also received. When pipe was pulled, it contained 2 qt. of oil.

Mission Canyon Zone Entered at Hastings Test

Imperial Oil Ltd.'s discovery well in the Hastings area of southeast Saskatchewan has penetrated the Mission Canyon zone in which oil was found and is currently drilling ahead in search of Charles porosity, also in the Mississippian formation.

This strike, Imperial 1-35M Hastings, LSD 1, 35-4-33w1, was reported to have run four more drill-stem tests in which the water line for the discovery horizon was established.

On the basis of those tests approximately 60 ft. of oil-bearing zone was encountered, with oil flowing to surface on three of the seven tests run. The Mission Canyon was topped at 3,702 ft., and the water-line was recorded at approximately 3,762 ft.

GREAT LAKES

MICHIGAN

A wildcat oil and gas test in Denver Township, Newaygo County, where a top Traverse gas pay, with some free oil showing, was demanding top interest in Michigan this week.

Wildcat is the Klondike Petroleum Co., Inc. 1 Hoge, NE SE SE 5-14n-14w. Top of Traverse lime was logged at 2,101 ft. At 1 ft. in this objective, 2,102 ft., well started to show gas which was gaged at 700,000 cu. ft. a day from open hole. No oil showed at this point, but by deepening 6 ft., a show of black oil was logged, and according to later information, additional one-foot deepening, to about 2,109 ft., resulted in log of a show of green oil which was under test at last report.

Wildcat is structurally higher, from 40 to 100 ft., over surrounding control points on this horizon. Much of the earlier exploration in this area was done by the same group, sometimes under the Klondike banner, sometimes under other names. Area was core-drilled by Carter Oil Co. and Carter was reported to be a contributor to the drilling of this wildcat.

● In St. Clair County, about 7½ miles west of West Becher field, Ontario, Canada, Panhandle Eastern Pipe Line Co. logged a basal Salina, A-1 dolomite oil pay at its 1 Tucker Comm., SE SE SW 10-3n-16e, Cottrellville Township. This wildcat logged A-1 dolomite at 2,168 ft. First oil pay was drilled with cable tools between 2,175-82 ft. where hole filled 250 ft. with free oil, plus a good head of gas, in 12 hours.

PACIFIC COAST

WASHINGTON AND OREGON

Exploration activity in the Pacific Northwest last week was marked by the abandonment of two wildcats.

The California-Washington Petroleum Corp. abandoned its 7,000-ft.-deep 1 Novalich in the Aberdeen area of Grays Harbor County, Washington. Sinclair Oil & Gas Co. gave up on its 1 Eastern Oregon Land Co. well in the Willow Creek area of Malheur County, Oregon, after drilling to 4,888 ft.

Also in Oregon, Standard Oil Co.'s 1 Pexco was drilling ahead at 3,125 ft. in the Bend region of Crook County. Sinclair was running protective casing to 6,500 ft. in 1 Government Mapleton in the Swisshome region of Lane County.

In Washington, Richfield Oil Corp. was drilling ahead at 3,950 ft. on its 1 Weyerhaeuser in Grays Bay region, Wahkiakum County.

CALIFORNIA

Moorpark Wildcat Testing

A drill-stem test at Humble Oil & Refining Co.'s. wildcat near Moorpark, Ventura County, yielded gas and oil-cut mud. At the conclusion of a 1-hour test, during which some gas was produced, 1,200-ft. of oily, gassy drilling mud were recovered. The well, Humble 1-B E. H. Williams in 4-2n-19w, was tested at the interval 6,220-6,463 ft. The operator continued to drill ahead after the test and had reached a depth of 6,761 ft.

Gas Search Gains in Sacramento Valley

Gas activity in Sacramento Valley continued to grow with the announcement that Honolulu Oil Corp. plans three more tests in the area. Two are stepouts to its discovery at Compton Landing in Colusa County. The other is planned in the Princeton area. All are joint ventures with Humble Oil & Refining Co.

This latest activity in the valley, where a dozen rigs were at work on wildcat and field wells, was precipitated by Honolulu 1 Honolulu-Humble-Tuttle. The discovery flowed 2,030 M.c.f. of gas daily through a 20/64-in. choke from Cretaceous sands at 3,700 ft.

Honolulu 1 Welch will be drilled in SE NW 12-17n-2w. The other Compton Landing test, 1 Helpenstine-Hall, is to be spudded in SE SW 1-17n-2w. The former will be ½ mile southwest of the discovery and the latter will be a north offset.

Richfield to Slant-Drill Goleta Test

Drilling from a site on the seashore campus of the University of California at Santa Barbara, Richfield Oil Corp. shortly will slant a test offshore to a state-granted lease. The joint test with Honolulu Oil Corp. and Signal Oil & Gas Co. will be 309-5 State in 30-4n-28w. Previous exploration by other operators, including a 5,273-ft. dry hole drilled in 1929, was unsuccessful.

New Wheeler Ridge Test

Richfield Oil Corp. has staked a wildcat 1½ miles northeast of Eocene production in Wheeler Ridge field, Kern County. It is expected that the test, 24-24 Kern County Land-G will shoot for the 10,000-ft. Eocene pay which is producing almost two-thirds of the field's 6,600-bbl. daily output. Site is being readied in NW 24-11n-20w.

Ventura Wells Completed

Tide Water Associated Oil Co. completed two excellent D-8 zone producers in the eastern portion of Ventura Avenue field. Its 107 Ventura

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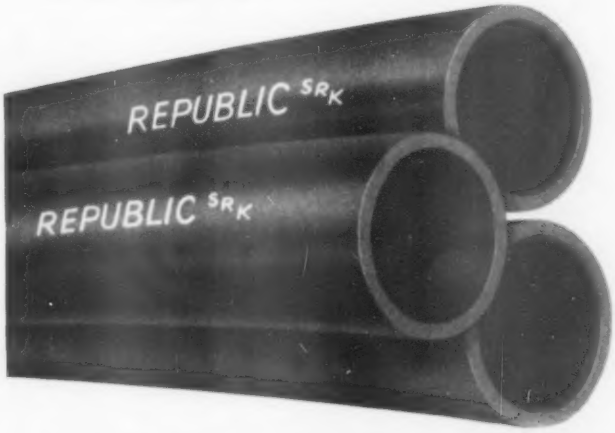

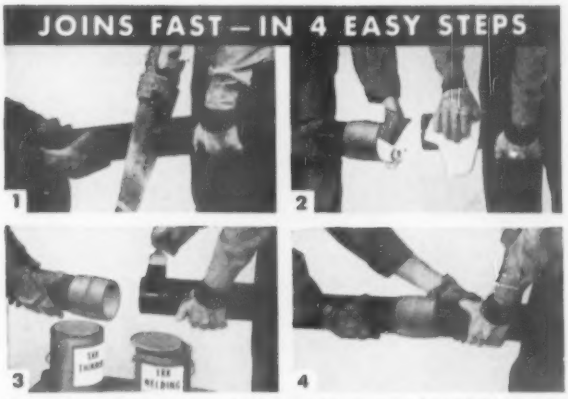

Follow these quick steps to make dependable, lasting joints. (1) Cut pipe to desired length. (2) Clean outside of pipe, inside of plastic fitting (Kralastic fittings are gray). (3) Using paint brush, coat inside of fitting, outside of pipe with cement. (4) Stab pipe into fitting, give one-eighth turn, and the job is done.

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PRODUCTION—SRK greatly reduces downtime due to paraffin clogging. Smooth interior surface permits high rate of flow, resists large paraffin buildups that result in costly cleaning shutdowns.

Because it's extremely rugged, Republic SRK can withstand rough treatment from rocks, tools and handling. Impact strength is high—and over a wide range of temperatures.

Republic SRK comes in a wide range of sizes: ½" through 6" as recommended by the AGA subcommittee on plastic pipe; plus sizes ½" through 2"—150 lbs. PSI; 2" through 6"—100 lbs. PSI; 3" through 6"—75 lbs. PSI. It will pay you to investigate Republic SRK. To get the complete story, *send coupon today.*

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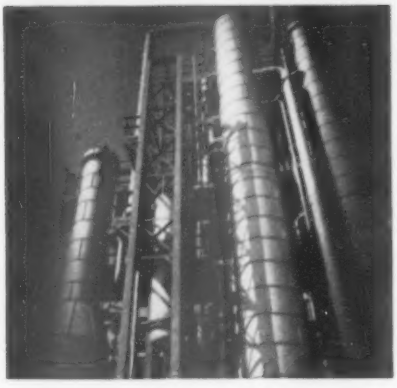

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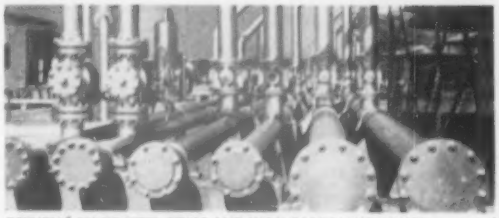
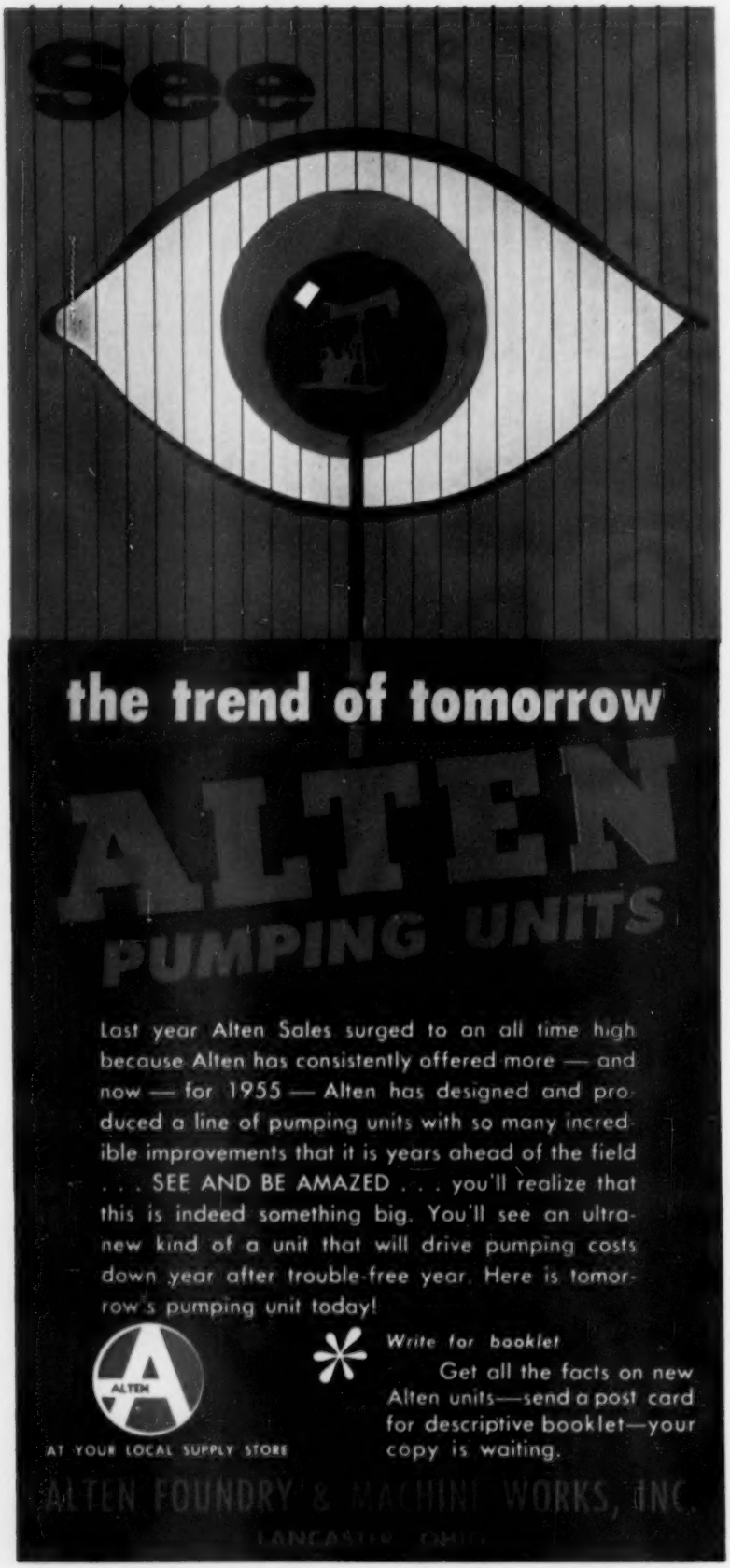


REPUBLIC ALLOY STEEL STUDS AND HIGH CARBON HEX NUTS are used where high pressures and extreme heat must be locked in — and corrosion locked out. Clean, accurate threads provide easy tightening, maximum holding power, resistance to wear and trouble-free backoff for equipment maintenance. And there's no danger of stripping or slipping from heavy wrenching. Save money by specifying these dependable fasteners on your next order. Keep a supply on hand for replacement needs.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Land & Water Co. flowed 1,360 bbl. daily through a 14/64-in. choke from 12,492 ft. About 1 mile west of this completion, its 178 Lloyd tested at a 1,248-bbl. rate from 12,270 ft. Unlike most D-8 wells, the water cuts were small, 0.3 and 6.1 per cent, respectively.

Offset to Strand Discovery Misses

Shell Oil Co.'s first confirmation test to the deep Vedder sand discovery it recently scored on the north edge of the Strand field, Kern County, proved a failure. A formation test of the 12,400-ft. zone yielded only water.

The company, however, will seek to complete 73X-12 Shell-Ohio-K.C.L., a south offset to the discovery, in the shallower Stevens zone. This middle Miocene sand showed promise on an earlier test, as it likewise did in the Vedder discovery well.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

New Discovery Hinted At Kiowa County Test

Another Mississippian oil pool is indicated at Gramehart-Miller's 1 Betzer in C NE 34-39s-16w, 2 miles northwest of Belvidere, Kans.

The hinted discovery, 2 miles southwest of Soldier Creek pool, swabbed and flowed 5 bbl. of oil hourly for 4 hours through perforations in the lime at 4,632-47 ft. The operator is now testing.

Nichols outpost . . . Gulf Oil Corp. 1 Wright, an outpost well to Nichols gas field, flowed 3,050 M.c.f. of gas per day from the Mississippian on 21/64-in. choke. Location of this well is in NW NW SE 24-29s-17w.

TEXAS PANHANDLE

Pennsylvanian Discovery Seen for Ochiltree County

Sparsely productive Ochiltree County has a possible Pennsylvanian discovery in the making. It is Woodson Oil Co. 1-A Perry Unit in Section 1012, Block 43, H&TC Survey, in the north central part of the county, 4 miles from closest production at The Texas Co. 1 Barlow (Morrow gas pool).

The operator drill-stem tested at 6,380-6,400 ft. in the Douglas sand. Recovery was 370 ft. of free gas and 20 ft. of gas-cut mud. The third test taken at 6,425-45 ft. made 1,500 ft. of free gas, 100 ft. of gas-cut mud, and 1 qt. of free oil in the tool.

Advantages like these make SHAFFER The leading choice in pressure control

WHEN YOU are in the market for pressure control equipment, be sure to contact Shaffer before you make your final decision. Shaffer offers to the industry the most complete line of pressure control equipment—including both Hydraulic and Mechanical Cellar Control Gates—*equipment that is field-proven for safety, simplicity and rugged dependability!*

Check over some of the typical advantages that have made Shaffer the leader in pressure control...

SHAFFER HYDRAULIC CELLAR CONTROL GATES

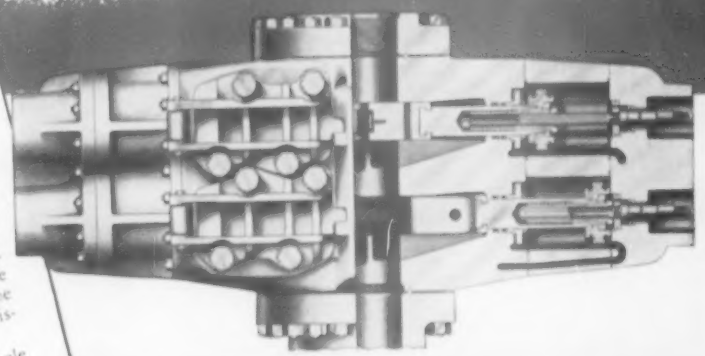
combine proven dependability with maximum compactness!

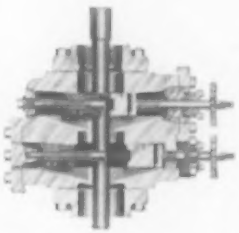
▶Side-opening doors permit quick, easy ram changes without need for expanding critical height or length dimensions to allow room for changing rams.

▶To change rams, simply open the door, replace the rams, then bolt the doors shut again. Closing the doors automatically aligns the rams in the Gate. In Shaffer Double Gates, there is no need to disassemble the upper unit to change rams in the lower unit. Rams in *either* compartment can be changed separately and independently—without disturbing the *other* compartment!

▶Available in both Double (illustrated) and Single designs to provide maximum flexibility for various well requirements. Even in sizes as large as 13⅝" (12" Series 900) the Double Gate provides two ram compartments in an overall height of only 30". Smaller sizes require even less space!

There are many other unique features. Be sure to get the complete story before you buy any control gate equipment. Available in a complete range of sizes and pressure ratings!





Shaffer Mechanical Cellar Control Gates

▶Available in both Double (illustrated) and Single types for operation by compact air drives—*plus manual stand-by!*

▶Require very little space—less than 29" height for the Double Gate in sizes as large as 13⅝" (12" Series 900)—*smaller sizes even less!*

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▶Both maintain a continuous seal around the various diameters and shapes in the drill string—round, square or hexagonal—whether string is rotating, being raised or lowered, or is stationary.

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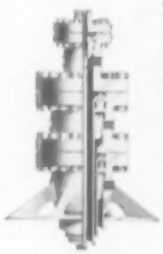

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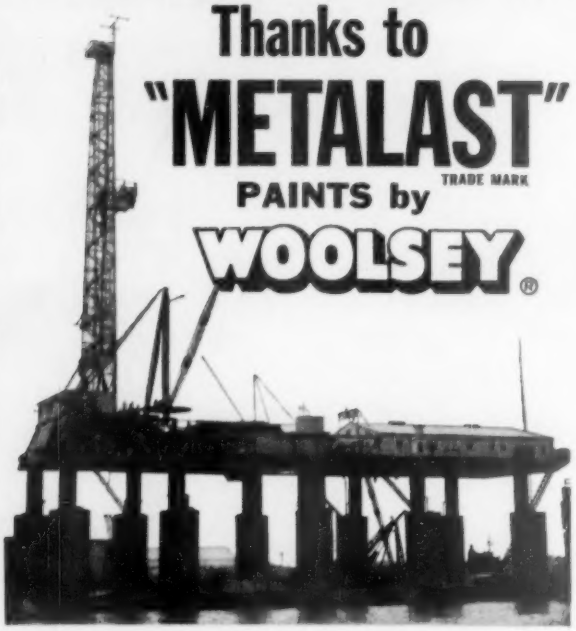

Ocean Drilling & Exploration Co. of New Orleans, La. chose "Metalast" to paint and protect this new $2,500,000 drilling rig.

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WEST TEXAS-NEW MEXICO

WEST TEXAS

Tom Green County Gains Discovery and Extension

The two-well Christoval field, south of San Angelo in Tom Green County, has been extended over ½ mile to the south, and had a new pay zone added, at Stanolind Oil & Gas Co. 3-A Willis Johnson.

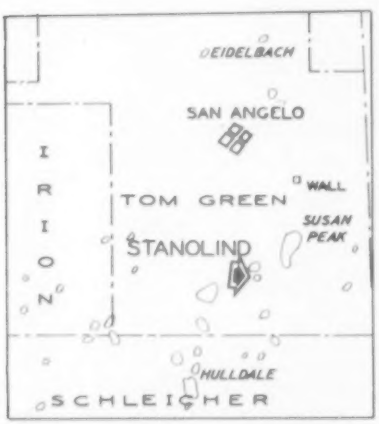
The discovery was completed last week for a flowing potential of 210.8 bbl. of 30.8° oil through 14/64-in. choke, from Canyon sand perforations at 5,088-92 ft. Flowing pressure was 450 psi.; gas-oil ratio was not reported. Operators had fractured the section with 10,000 gal.

Location of the new producer is in Section 176¾, A. D. Neill Survey. Regular pay at Christoval field is in the base of the Palo Pinto, locally called Turkey Creek, from 4,640-68 ft. The field discovery was later recompleted, dually, as a gas-distillate discovery from Strawn lime at 5,244-59 ft.

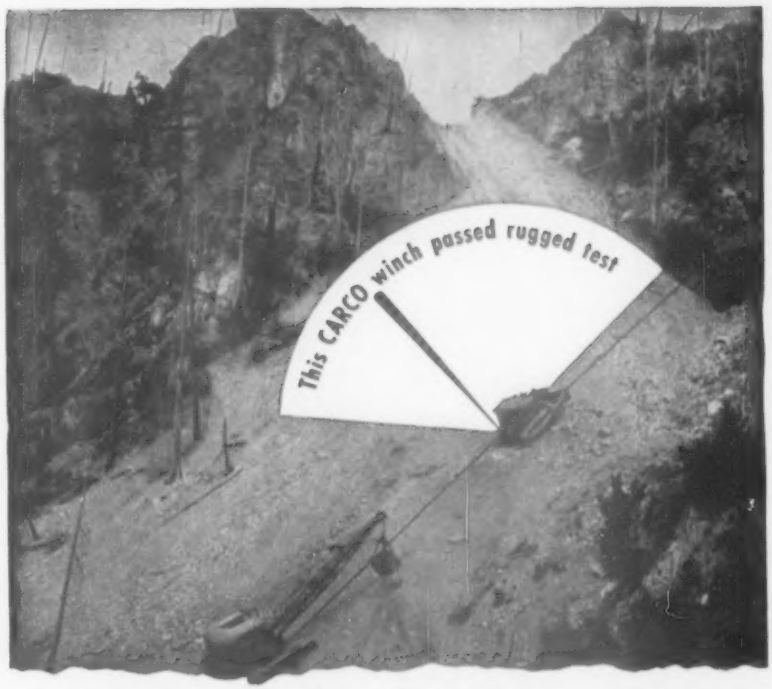
Another Tom Green County discovery prospect was Murray Petroleum Co. 2 George Foster Rust, wildcat in 169-11-SPRR. Location is 6 miles southeast of Wall.

On drill-stem test at 4,092-4,107 ft., in Canyon sand, the well flowed gas in 1 minute, and was gaged at the rate of 12,000-15,000 M.c.f. of gas per day through ½-in. choke. There was a spray of oil with the gas. Flowing pressure ranged from 1,020-1,260 psi., and shut-in pressure 1,655 psi. Drilling continued below 4,133 ft.

The well first showed gas, of around



Stanolind's 3-A Johnson in southern Tom Green County, has extended and added a new pay to Christoval field. Murray Petroleum 2 Rust, not shown on the map, is about 5 miles northeast of northern tip of Susan Peak field.



CARCO winches held fast when slippage meant disaster

... on tough Alberta to Vancouver pipeline job

Towing and holding heavy equipment on steep grades is a severe test of a winch brake. On the Model J Carco winch, the automatic, self-energizing brake will hold any load the winch can pull. It takes hold the instant tractor clutch is disengaged. Full braking power comes from high ratio leverage contracting the band on brake drum. Brake unit is reversible, permitting under- or over-wind free-wheeling. Brake release mechanism gives the operator complete load control at all times. The load can be checked at any point and even be "inched" down. Brake is enclosed, protecting it from the elements or external abuse.

Mr. G. T. Guest, Assistant to Project Manager of Comstock Midwestern, Limited, builders of "Big Inch-by-Inch", says, "The job needed Carco winches for towing and holding heavy machinery on steep grades and even for holding men by life lines. Had a single winch failed, men and machinery would have been lost. We found Carco winches equal to everything we asked of them."

On top of hill a Model J Carco winch is winching the Carco J winch and International TD24 shown above up steep slope at Coquihalla Canyon while it, in turn, is winching up clam digger.

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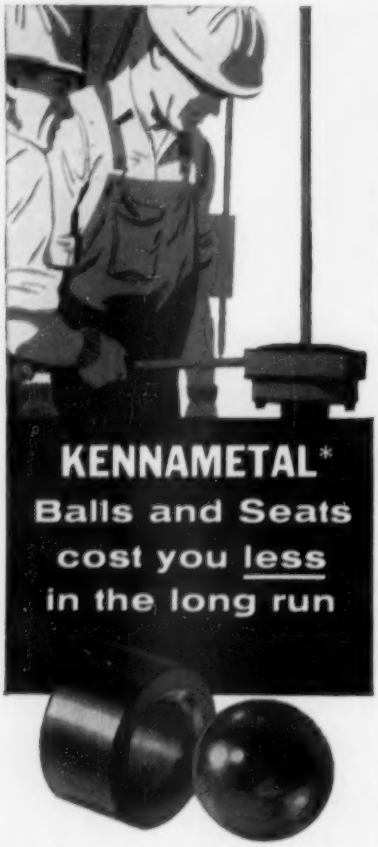

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Reports from users during the past 16 years show that Kennametal lasts 20 times longer than steel and 3 to 5 times longer than special and super alloys.

- A Texas producer reported sand abrasion forced a pulling job every 14 to 20 days. After 448 days on the job, Kennametal Balls and Seats showed no wear, when well was pulled for other than valve job, and the valving was rerun for longer service.
- A California well used up a set of best alloy-steel balls and seats every 3 weeks. A Kennametal valving set has been in service for 72 weeks without need for replacement.
- In a Kobe valve plate operating at 50 to 80 closures per minute, Kennametal has survived 9,000,000 closures under 3200 psi in oil and water fluid from 8000 feet. Parts still acceptable for re-use.

Kennametal API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. *They'll cost you less in the long run.* KENNAMETAL INC., Latrobe, Pennsylvania.

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Longer pump life, less downtime, lower pump cost

10,000 M.c.f. volume, on test at 4,075-90 ft., also in the Canyon sand.

GULF COAST

SOUTH LOUISIANA

New Gulf of Mexico Field Opened Off Cameron Parish

Another wildcat in the Gulf of Mexico has been found productive. Drilled by Continental Oil Co. and located in Block 49, East Cameron area, it flowed condensate-spraying gas while cleaning through 3/16-in. choke. No gage was taken of volume, pending potential tests. Flow was under pressure of 4,470 psi., with pay zone perforated at 11,090-96 ft.

Location is 19 miles off shore from Cameron Parish. It is the third discovery of this parish within the past 3 weeks. Nearest other field is 12 miles southeast in Block 71.

Portion of East Cameron area in Gulf of Mexico, off Cameron Parish, showing location of Continental Oil Co.'s new gas-condensate discovery well. Two black stars in upper portion of map are recent gas-condensate discovery wells.

TEXAS GULF COAST

Yegua Discovery Opens New Barbers Hill Pool

The Texas Co. has opened a new producing horizon and sector on the old Barbers Hill dome, in northwestern Chambers County, 35 miles east of Houston.

Its discovery well, 1 Kirby, located on the north flank, nearly a mile from nearest other production on the dome, is rated good for 62,000,000 cu. ft. of gas per day, open-flow potential. Gas carries 35 bbl. of 50.4° -gravity condensate per million cubic feet. Shut-in pressure is 5,840 psi.

The new producing horizon is in Yegua sand, perforated at 10,743-84 ft. and 10,806-22 ft. Hole was drilled to 12,505 ft. It is the first Yegua production for this dome. Production so far has been from Miocene and Oligocene sands.

Drilling is getting under way on a confirmation test, located 956 ft. northwest on the same lease. It is projected to 13,500 ft.

New Jasper County Field Opened in Yegua Section

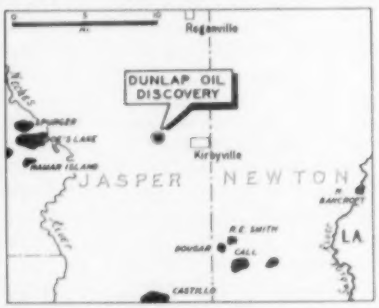
W. C. Dunlap's new oil-discovery well, 1 Mixson, 2 miles west of Kirbyville, in Jasper County, produced at the rate of 240 bbl. of 41° -gravity oil per day during its official potential gage.

Flow was through 5/32-in. choke with tubing pressure of 900 psi. and gas-oil ratio of 515 cu. ft. per barrel.

Production is from Yegua sand, perforated at 6,286-88 ft. Hole was drilled to 6,910 ft.

The discovery, tentatively designated as Kirbyville field, is 8 miles from nearest production, this being in Joe's Lake and Spurger fields, in Tyler County. Joe's Lake production is from Wilcox sands. Spurger, just north of Joe's Lake, produces gas from Yegua sands.

Spot location of the new well is in the J. M. Van Pelt Survey 34.



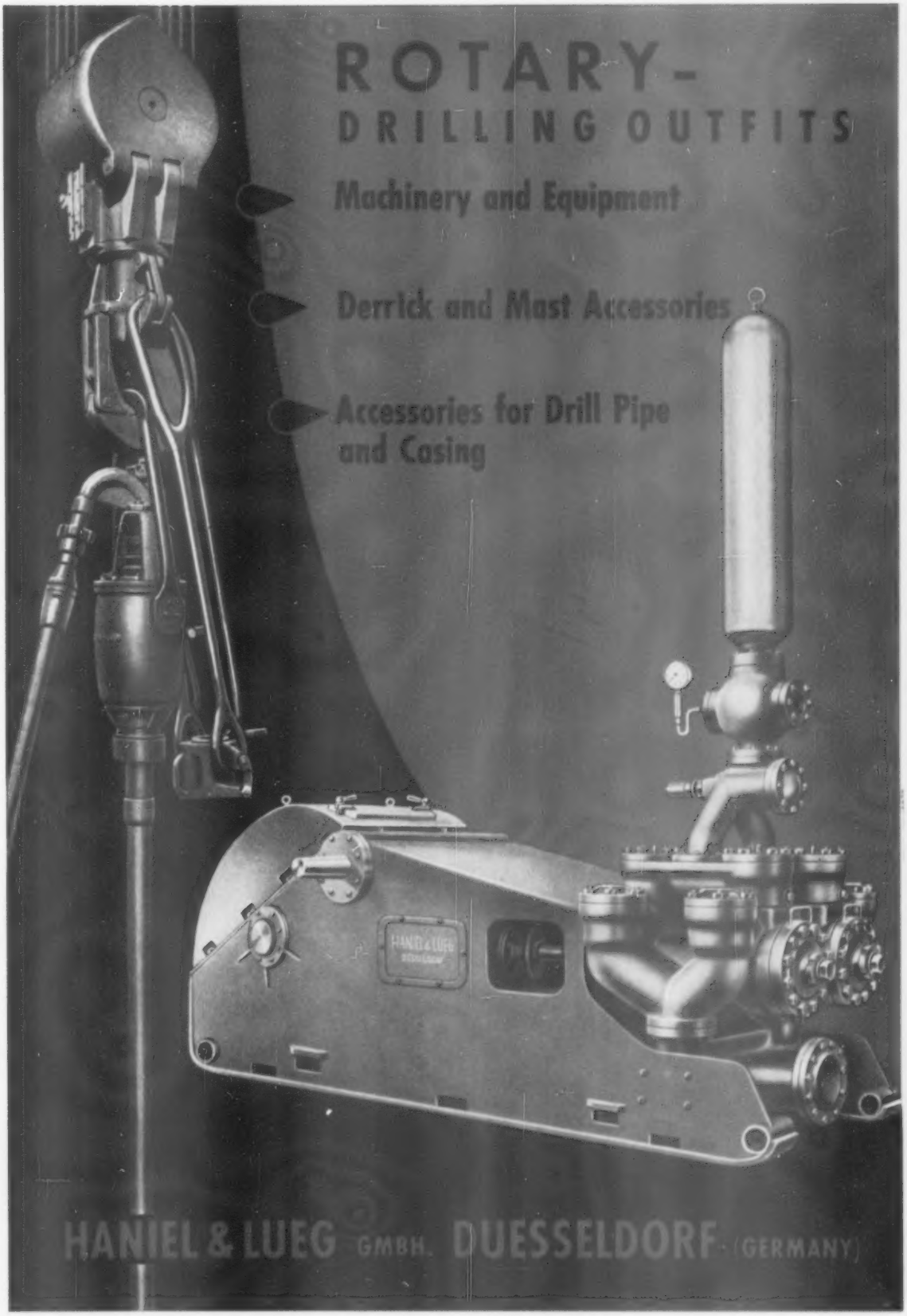
Location of W. C. Dunlap's new oil-discovery well in Jasper County, eastern Texas.

SOUTHWEST TEXAS

Buda-Del Rio Discovery Indicated in Atascosa

Discovery of another new field in Atascosa County is indicated in initial tests in a wildcat drilled by Continental Oil Co. south of Pleasanton. Indicated production is in the base of the Buda lime, or the top of the Del Rio, in the Lower Cretaceous section. Either formation would be a new producing horizon for the county, whose previous production has been mainly from Upper Cretaceous Navarro sands, or shallower formations.

Continental's prospective well, 1 Sutton, has been testing promising oil showings in open-hole section at 7,164-7,435 ft. During one test run, of 17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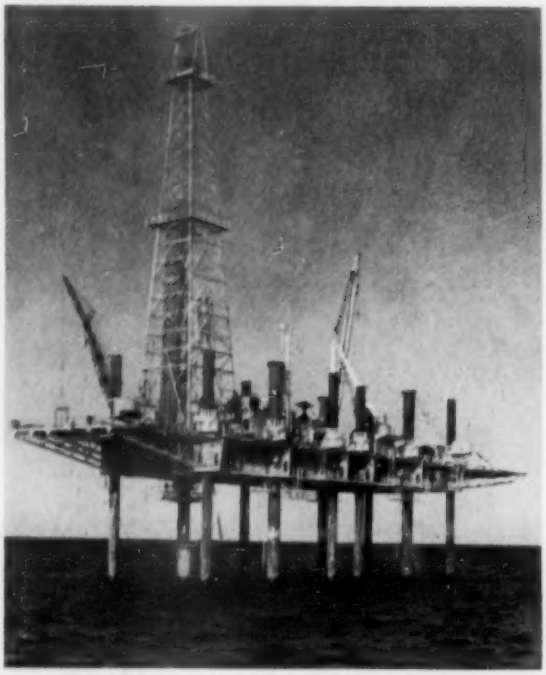

"Mr. Gus," a mobile drilling platform having successfully completed two wells for Shell Oil Company, drills ahead below 11,000 feet for the Atlantic Refining Company and Tide Water Associated on their No. 1 Federal Tract 726 located in 84 feet of water 15 miles East of Port Aransas, Texas.

"Mr. Gus" recently experienced a tropical storm of approximately forty hours duration during which the recorded winds were consistently above sixty miles per hour and several hours registered seventy to eighty. The seas ran from thirteen to twenty-four feet. No damage was sustained and the rig remained stable over the location.

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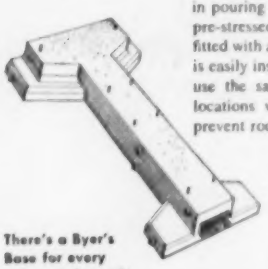

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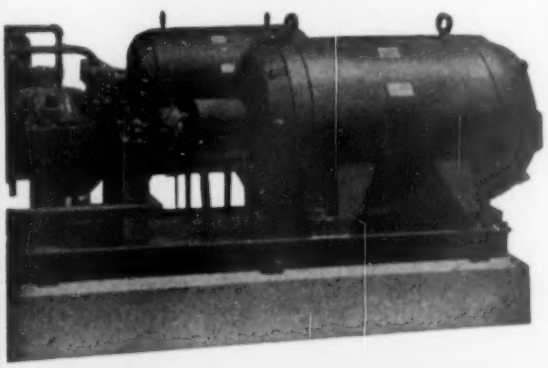

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hours through ⅛-in. choke, it produced 135 bbl. of 30°-gravity oil with pressure dropping from 840 to 620 psi. During a later 39-hour gage through 3/16-in. choke, flow was 317 bbl. with pressure ranging from 500 down to 260 psi. Since then, flow has levelled around 6 bbl. per hour.

Location, in the M. de la Garza Survey, is about 4½ miles northeast of Jourdanton. Nearest production is the new Velma-Escondido field (not shown on accompanying map), about 2 miles southwest. Imogene field is about 3 miles south.

Pleasanton - Jourdanton area of Atascosa County showing location of Continental Oil Co.'s Buda-Del Rio oil-discovery well. Not indicated is .5e new Velma (Escondido) field, nearest production, 2 miles southwest.

Eagle Ford Oil Producer Revives Old Clark Field

Production in the abandoned Clark field, 12 miles southeast of Seguin, in Guadalupe County, on the Bacones fault trend, is being revived with a new-pay oil discovery by Honor Oil Co., of Shreveport.

The new production is from the base of the Austin chalk and the top of the Eagle Ford. Former production was only from Austin chalk.

Chalk was logged at 2,358-2,506 ft. with Eagle Ford to the well's total depth at 2,536 ft. Casing was run to bottom and perforated at 2,497-2,530 ft.

The well, 1 Fitzpatrick, pumped 88.11 bbl. of oil (net) per day following acidization. Water production was at the rate of 15 per cent of the total fluid.

The field was opened in 1935. Last production was in 1952. Accumulated production totaled 418,500 bbl.

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Carbon County, 1830 Harriet C. McClure, wildcat after running 7-in. casing at 7,422 ft., in the top of the Onondaga lime and cemented, is now rigging up cable tools to finish the hole.

WEST VIRGINIA

Licking district, Tucker County, West Virginia, Hope Natural Gas Co. 9949 W. Asa Street, elevation 2,271 ft., is drilling at a depth of 4,478 ft., in the chert which was topped at 4,369 ft. A show of gas gaging 38,000 cu. ft. has been recorded in this formation.

Union district, Preston County, Columbian Carbon Co. 1217 Theodore R. Rembold, elevation 2,599 ft., is drilling at 4,952 ft. No further gas since the blowout at 4,368 ft., has been reported. Cumberland & Allegheny Gas Co. 535 C. R. Lipscomb is drilling at 3,155 ft.

OHIO

Probably one of the best producers in the newly opened area below Cottage Hill in Hopewell Township, Muskingum County, was brought in by Grumbell and Reed on J. L. E. Grimes in Section 6, Clinton at 3,314-66 ft. with a good showing natural made 500,000 cu. ft. gas and 516 bbl. oil in a 24-hour test after treatment.

• W. E. Shrider completed a west offset in the new pool developing south of New Guilford in Perry Township, Coshocton County. Second Clinton sand at 3,173-3,197 ft. made only a small showing natural, but increased to 375 bbl. in 24 hours after fracturing.

• The Disbennett Petroleum 1 Didinger, Lot 39, Clark Township, Coshocton County, a west extension of ¼ mile to Layland pool, logged the Clinton at 3,570-3,612 ft., and made 70 bbl. and 300,000 cu. ft. gas after fracturing.

EASTERN KENTUCKY

On Puncheoncamp Branch, Magoffin County, Kentucky West Virginia Gas Co. have completed 6282 Milt Fletcher as a dual zone gas well. Producing zones are: Corniferous topped at 2,078 ft. and Big Six sand topped at 2,604 ft. After shooting with 725 lb. of gelatin, gas gaged initially at the rate of 503,000 cu. ft. daily from a total depth of 2,629 ft.

Successful Wildcats

COLORADO

Adams County: Hicks, Balderson Drilling Co., Virgil King 1 Perle, C SW SW 6-1s-58w, IP 1,500 M.c.f. of gas per day, "D" sand discovery, new field. TD 6,341 ft. "J" sand.

Logan County: New Drilling Co. 1 Arm-

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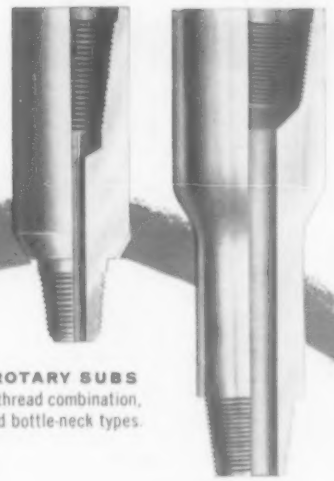

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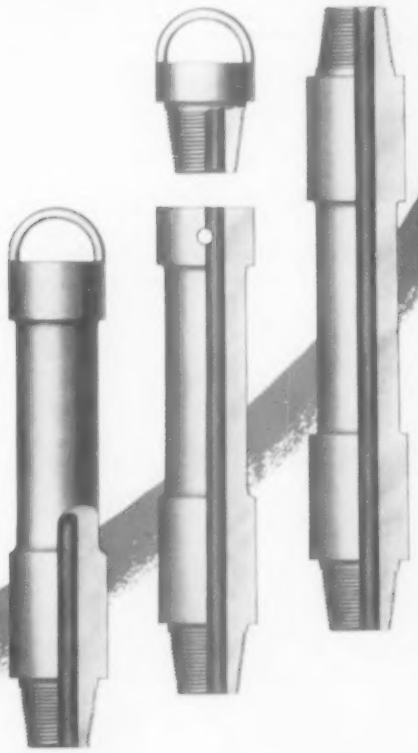

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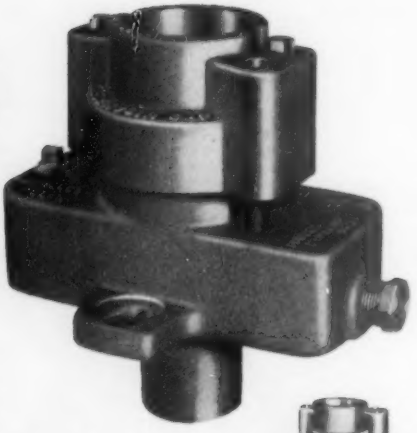

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strong, 7-8n-53w (C S½ of East 57 acres of Lot 3). IPP 176 BOPD, "J" sand discovery, new field. TD 4,880 ft. "J" sand.

True, R. H. Fulton 1 Wagner, NW NW NE 35-9n-53w. IP 3,000 M.c.f. of gas per day, "J" sand discovery, new field. TD 4,931 ft. "J" sand.

Morgan County: Delta Drilling Co., Arrowhead Exploration Co. 1 State, SW SW NW 35-6n-55w. IPP 121 BOPD, "D" sand discovery, new field. TD 5,273 ft. "J" sand.

KANSAS

Meade County: Shamrock Oil & Gas Co. 1 Langhafer, C NW SE 18-33s-30w. IP 9,000 M.c.f. of gas per day, Morrow sand 5,654-63 ft.; Chester 5,664-75 ft. TD 5,698 ft. East Kismet area gas discovery.

Ness County: Ohio Oil Co. 1 Vermilion, C SW NE 6-17s-24w, 3 miles from nearest production. IPP 188 BOPD, Fort Scott lime 4,385-96 ft., 38.3°. TD 4,604 ft. (Oil discovery).

Sedgwick County: Time Petroleum Co. 1 Dugan, SW SW NE 18-28s-1w. IPP 25 BOPD, Mississippian 3,392-3,401 ft., 44°. TD 3,401 ft. (Opens South Schulte pool.)

SOUTH LOUISIANA

Cameron Parish: Phillips Petroleum Co. 2-B State Lease 1435, Block 39, West Cameron area, Gulf of Mexico. IP 4,500 Mc.f. daily, ¼-in., dry gas, perforations 9,500-17 ft. TD 10,483 ft. (Extends, and new pay in West Cameron Block 40 field.)

Frankfort Oil Co. 1 Lutcher-Stark, 25-14s-12w (2 miles northwest Mud Lake field.) IP 65 BCPD and 3,245 M.c.f. daily, 7/32-in., 57.8°, perforations 12,869-82 ft. TD 12,991 ft. (New field, or long extension of Mud Lake field.)

Lafayette Parish: California Co. 1 Lafayette Parish School Board, 16-9s-3e. IP 566 BOPD, 9/64-in., 37°, GOR 773 cu. ft. per bbl., perforations 12,114-26 ft. TD 14,508 ft. (New pay in South Bosco field.)

Terrebonne Parish: Humble Oil & Refining Co. 2-A State Lease 1085, Block 54, South Timbalier area, Gulf of Mexico. IP 291 BOPD, ¼-in., 38.1°, GOR 558 cu. ft. per bbl., perforations 6,854-66 ft. TD 9,000 ft. (New pay in South Timbalier Block 54 field.)

MONTANA

Fallon County, Pennel area: Shell Oil Co. 22X-36 State, SE SE NW 36-8n-59e. IPP 205 BOPD, Red River-Ordovician discovery, new field. TD 9,240 ft. Ordovician.

NEBRASKA

Cheyenne County: Harper Oil Co., Dunn & Boreing 1 State, NE SE NE 16-15n-49w. IPP 80 BOPD, "D" sand discovery, new field. TD 4,685 ft. Skull Creek.

Kimball County, Bukin State: U. S. Smelting, Refining & Mining Co., Cortez Oil Co. 1 State-Bukin, C SW SW 8-12n-53w. IPF 297 BOPD, "J" sand discovery, new field. TD 5,810 ft. "J" sand.

Vavra: Elpasgar Oil Co., Shawano Development 1 U. P. Vavra, NW NW NW 3-15n-58w. IPP 57 BOPD, "J" sand discovery, new field. TD 7,150 ft. "J" sand.

NORTHWEST NEW MEXICO

San Juan County: Great Western Drilling Co. 2 Chaco Canyon Unit, W½ SW SE 16-23n-8w. IPP 15 BOPD, Tocito discovery, new field. TD 6,098 ft. Morrison.

1 Chaco Canyon Unit, NW SE NW 14-23n-9w. IPP 15 BOPD, Tocito discovery, new field. TD 5,830 ft. Morrison.

NORTH DAKOTA

McKenzie County: The Texas Co. 1-A Helle, NW NE 8-151n-95w. IPF 313.5 BOPD, Charles discovery, new field. TD 9,418 ft. Charles.

OKLAHOMA

Beaver County: Union Oil Co. of California 1 Parker, C NW SE 11-2n-23eCM. IPF 28,250 M.c.f. of gas per day and distillate from the Morrow sand at 7,096-7,100 ft., 59.4° gravity. TD 7,918 ft. (An important gas-distillate discovery in southeast Beaver County).

Grady County: Frankfort Oil Co. 1 Mutz, NW NW 24-5n-7w, 1 mile north of West Chitwood field. IPF 352 BOPD, Hoxbar 9,852-66 ft.; 436 BOPD, Deese sand 9,948-10,044 ft.; 24/64-in. tubing choke and ¾-in. casing choke. 38° and 40.5°. TD 10,645 ft. (Oil discovery).

Grant County: Calvert Drilling Co.-Woods Petroleum Co. 1 Leisure, 1¾ miles east of Southeast Eureka field, SE SE SW 9-28n-8w. IPF 1,372 BOPD, basal Penn. sand 4,873-83 ft., 41°, 30/64-in. choke. TD 4,943 ft. (Oil discovery).

Woods County: Amerada Petroleum Corp. 1 Farris, 15 miles northwest of Ringwood field, C SW NW 21-24n-13w. IPF 285

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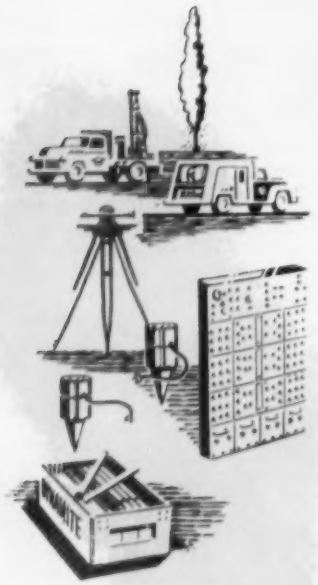

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Delhi-Husky-Phillips-Richfield A16-23 Bone Creek, LSD 16, 23-10-19w3. TD 4,528 ft. Upper Shaunavaon oil well.

SOUTHWEST TEXAS

Atascosa County: Tom Crews 1 E. S. Crews, A. C. Hardcastle Sur. 1508¾, IP 90 BOPD, ⅛-in., 39°, GOR 375 cu. ft. per bbl., perforations 4,026-35 ft. (Navarro). TD 4,111. (New field.)

Brooks County: The Texas Co. 1 Hinojosa, Antonio Pena Sur., A-436. IP 77.5 BOPD, 45.8°, GOR 250 cu. ft. per bbl., perforations 4,020-28 ft. (Frio). TD 5,310 ft. (New pay in Palo Blanco field.)

Duval County: W. Earl Rowe 1 Loving, R. Spence Sur. 27. IP 73.3 BOPD, 7/64-in., 22.8°, Vicksburg 3,535-44 ft. (perforations). TD 3,950 ft. (New pay in Tesoro field.)

Guadalupe County: Honor Oil Co. 1 Fitzpatrick, Green DeWitt Sur. 13, A-18. IPP 88.11 BOPD (net), 15 per cent water, perforations 2,497-2,530 ft. (Eagleford). TD 2,536 ft. (Revives, and new pay in Clark field.)

Starr County: John J. Pichinson 1 Reyna et al, Porcion 71, Share 95. IPP 27.6 BOPD, 23.5°, perforations 624½-27 ft. (Hockley). TD 1,258 ft. (New field.)

Webb County: Skelly Oil Co. 1 Frost, GC&SF Sur. 782. IP 9,600 M.c.f. daily, open-flow potential, Rosenberg sand 1,620-27 ft. (perforations). TD 1,676 ft. (New field.)

Zapata County: C. C. Winn and Glen Martin 1 Velma, Share "H" of original Share 9, Porcion 27. IPP 40.7 BOPD (net), 65 per cent water, 24°, Crockett 1,377-93 ft. (perforations). TD 2,408 ft. (New field—Davy Crockett.)

TEXAS GULF COAST

Bee County: Gasoline Products Corp. and Houston Oil Co. 2 Borroum, Charles Baker Survey. IP 830 M.c.f. daily, open-flow potential, dry gas, perforations 3,062-65 ft. TD 3,074 ft. (New field.)

Brazoria County: Caroline Hunt Sands 1 Vieman, Shubal March Sur., A-81-82. IP 6,500 M.c.f. daily, open-flow potential, GLR 125 M.c.f. per barrel, 50.4°, perforations 9,516-20 ft. TD 10,618 ft. (New pay in Styles Bayou field. Discovery well recompleted in shallower sand; original completion from perforations at 9,887-91 ft.)

Clegg & Hunt and Bradco Oil & Gas Co. 1 Clement et al, Angier, Hall & Bradley, A-6. IP 46 BOPD, 3/32-in., 40.9°, GOR 730 cu. ft. per bbl., perforations 8,544-46 ft. TD 10,717 ft. (New reservoir southwest of Rowan field.)

Brazoria County: Ada Oil Co. 1 Todd Unit 2, Angier, Hall & Bradley Sur., A-6. IP 101.48 BOPD, ¼-in., 34.3°, perforations 10,814-24 ft. TD 11,015 ft. (New pay in Liverpool field.)

Galveston County: Sun Oil Co. 3 Hudnall, Zinn & Foreman Sur. IP 79 BOPD, XX-36 choke, 32.2°, perforations 6,806-08 ft. TD 6,850 ft. (New pay in Caplen field.)

Harris County: Russell Maguire 2 Scanlan, Victor Blanco Sur., A-2. IP 212.52 BOPD, 5/32-in., 39.4°, perforations 7,894-7,906 ft. TD 9,012 ft. (New pay in Alco-Mag field.)

Jasper County: W. C. Dunlap, Jr., 1 Mixson, J. M. Van Pelt Sur. 34, A-863. IP 240 BOPD, 5/32-in., 41°, Yegua 6,286-

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88 ft. (perforations). TD 6,910 ft. (New field—Kirbyville.)

Jefferson County: McCarthy Oil & Gas Corp. 1 Erickson et al, T&NO Sur. 164, A-623. IP 18e BOPD, 7/64-in., 33.7°, perforations 9,982-84 ft. TD 10,452 ft. (New pay in Big Hill field.)

Kleberg County: Standard Oil Co. of Texas State Well 947-28, State Tract 947 (General Land Office Survey), Gulf of Mexico. IP 1,035 M.c.f. daily and 10 BCPD, ⅛-in., 3,275 psi. (TP), perforations 8,546-52 ft. TD 10,200 ft. (New pay, and extends Chevron field.)

Liberty County: Jack W. Frazier 1 Wirt Davis estate, Rebecca Coleman Sur., A-156. IP 192 BOPD, 7/32-in., 39.2°, perforations 7,986-90 ft. (Yegua), and (dual completion) 222.5 BOPD, 5/32-in., 38.2°, perfs. 8,686-90 ft. TD 9,020 ft. (new field—Southwest Hardin.)

Nueces County: Lyons, McCord and Alvin M. Johnson (Lewis H. Weltman) 1 Mary Wright, Partition of Wright Lands, Vicente Lopez y Herrera Grant. IP 11 BOPD, ¼-in., 45°, perforations 6,561-66 ft., and (dual completion) 7,500 M.c.f. daily, open-flow potential, GLR 86.5 M.c.f. per bbl., 63°, perforations 6,500-19 ft. TD 6,667 ft. (New field.)

San Patricio County: Plymouth Oil Co. 17-E Welder, Welder Ranch Subd., Section 51. IP 40.1 BOPD, ¾-in., 30.2°, GOR 1,786 cu. ft. per bbl., perforations 6,489½-93½ ft. TD 7,092 ft. (New pay in Plymouth field.)

Matagorda County: Brazos Oil & Gas Co. 1-A State, Tract 194, Matagorda Bay. IP 9,200 M.c.f. daily, open-flow potential, perforations 2,654-74 ft. TD 5,858 ft. (New field.)

Wharton County: Gulf Coast Leaseholds, Inc., 1 M. D. Taylor estate, John Huff Sur., A-31. IP 128 BOPD 5/32-in., 28.2°, perforations 5,344-52 ft. (upper Frio). TD 6,732 ft. (New pay in Boling field.)

NORTH TEXAS

Grayson County: Standard Oil Co. of Texas 1 Shearer, SW SW Blk. 11, University Lge., 5½ mi. NW Sherman. IP 26 BOPD, 32/64-in., 34°, GOR 2200, TP 25 psi., Cordell, pay 9,466 ft. TD 9,700 ft.

Wise County: Biscayne Oil Corp. 1 McGuire, J. C. Weaver Sur., A-972, 4 mi. NW Chico. IP 6,200 M.c.f. gas, open flow, shut-in pressure 1,500 psi. Conglomerate pay 5,600-10 ft. TD 5,801 ft.

Young County: Lisle, Edwards & Inlis 1 Anderson, TE&L Sur. 269, A-516, 3 mi. N new Castle. IP 73 BOPD, ¾-in., 38°, TP 200 psi., GOR 300, pay 2,706-08 ft. TD 4,752 ft.

EAST TEXAS

Smith County: L. A. Grelling & American Liberty Oil Co. 1 Wilkinson, Ben Lafferty Sur., A-13, 1 mi. S Omen, 1 mi. N Omen-Woodbine field. IP 206 BOPD, ¼-in., no water, 40.8°, TP 500 psi., GOR 1040, Pettit perforations 8,200-10 ft. TD 8,426 ft. Elev. 438 ft.

WEST TEXAS

Crosby County: Bond Oil Corp. 1 Robertson, 19-B9-EL&RR, 12 mi. N Post. IPP 83.77 BOPD, 40°, GOR zero, pay 3,605 ft. TD 4,662 ft.

WEST CENTRAL TEXAS

Haskell County: Marshall Pipe & Supply Co. 1-A Ballard, Subd. 33, Red River CSL Sur. 75, 2 mi. SE Rochester. IPP 80.5 BOPD, 39°, GOR 250, sand 4,822-28 ft. TD 4,900 ft.

TEXAS PANHANDLE

Roberts County: Phillips Petroleum Co. 2 Gay, C SW NE Block M-2, Sec. 201, BS&F Sur. IPF 365 BOPD, 6,115-24 ft.; 6,274-86 ft., ¼ and ½-in. chokes, 40.2°. TD 12,122 ft. (Oil discovery.)

Machris 14-160 Fowlston, SW SW 13-160-T&NO Sur. IP 2,800 M.c.f. gas, pay 8,794-8,810 ft. TD 8,899 ft.

WEST VIRGINIA

Tucker County, Licking district: Hope Natural Gas Co. 9940 James E. Watson, elevation 1,809 ft., 1,900,000 cu. ft. gas after shot, Tully 4,105 ft., chert 4,497 ft., gas, Oriskany sand 4,695 ft., gas TD 5,065 ft.

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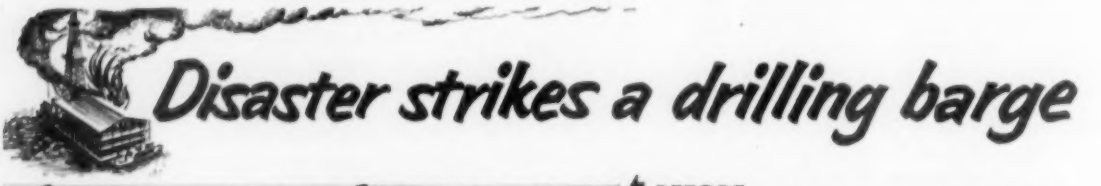
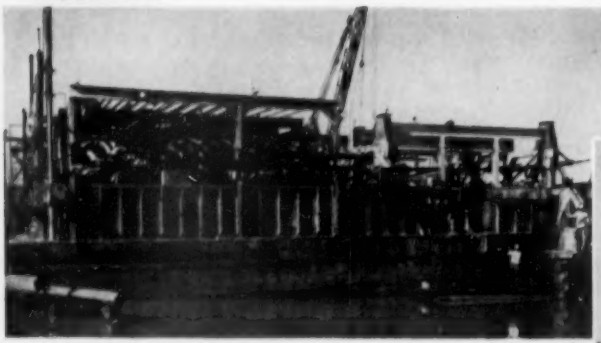
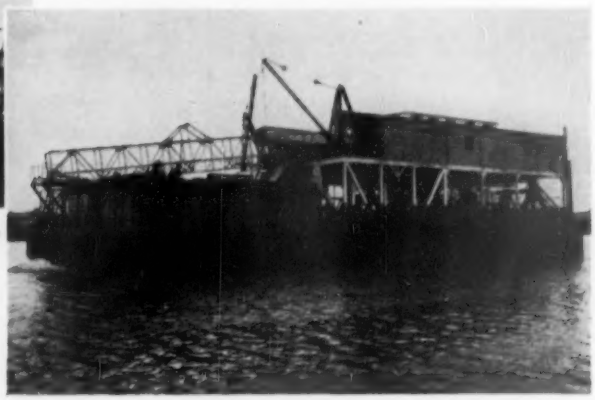


Disaster strikes a drilling barge



BEFORE—This is the appearance of a drilling barge which was severely damaged by fire when the well it was drilling in South Louisiana blew out and caught fire.



The same barge after being rebuilt and restored to its original condition by Levingston. Another example of Levingston's specialized skill in constructing and repairing marine drilling equipment .... **AFTER** **in rapid time.**

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A radio network speeds the service in Wyoming!

Downtime for lack of a repair part or vital operating supplies is costly anywhere and anytime. And if you're drilling 80 miles or more from the nearest telephone to service, you're really in trouble.

This was the situation in the rugged, barren area out beyond Casper and Newcastle, Wyoming. So National Supply—in keeping with its policy of supply service tailored to meet local needs—set up a mobile radio system to speed service to the drillers. A 250-watt transmitter 8,600 feet up in Casper Mountain and 50-watters in Casper City and Newcastle link seven two-way radio cars and National headquarters in Casper. Now National Supply field representatives anywhere within 300 miles can report the drillers' needs—or their own—instantly.

For over sixty years, oil men have been accustomed to exceptional service from National Supply stores in the far away desolate regions where they often have to go for oil. Although National is using two-way radio only in this rugged Casper area, the drillers probably aren't surprised that we've taken to it. Because, whether they're concerned about service or equipment that helps them to do a better job, users have come to expect something extra from National Supply.

First in quality...
First in supply service
in oil country everywhere

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1. Is it precision-made?
2. Thoroughly field-tested?
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7. Does it have high joint strength?
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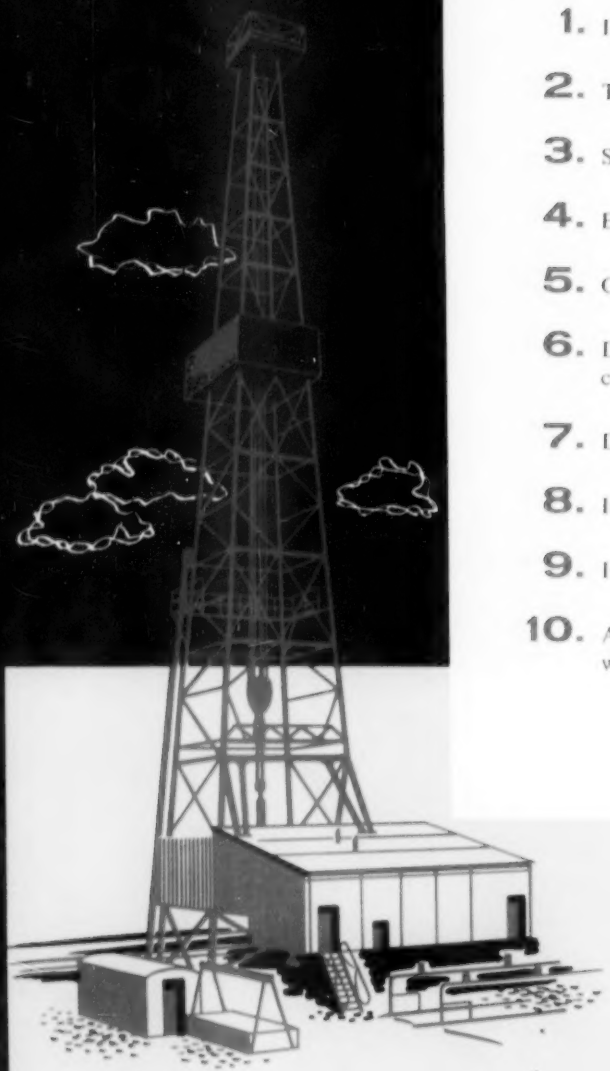
10. Available in different grades for varying well conditions?



...and for a YES answer to every one, SPECIFY

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EXTREME LINE® CASING

available in these grades for every well condition

GRADE **J-55**	55,000 PSI MINIMUM YIELD STRENGTH
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GRADE **P-110**	110,000 PSI MINIMUM YIELD STRENGTH

Your National Supply Representative will be glad to answer in detail these and any other questions you may have. See him soon!

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

See the next page for information on other important Spang tubular products...

...and 10 facts to consider when you specify tubing

SPANGSEAL® TUBING

1. Has 50% less connections
2. Provides 100% resistance to leakage
3. Provides more hole clearance
4. Eliminates "hanging-up" while running

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For maximum corrosion resistance, you can specify a multiple coat, baked phenolic plastic coating applied at the mill on Spang tubing, drill pipe and line pipe. Ask the National Supply Representative about this Spang service—and any other information you'd like to have about this quality tubing.

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

PERSONALS

Gladney Honored

Sun official selected for outstanding-service award

HAD Sam H. Gladney been an only child, he might today be an official of Magnolia Petroleum Co.

Instead, Gladney is general manager of the southwestern production division of Sun Oil Co. in Dallas. What Magnolia lost is shown by the fact that Gladney next week will receive one of the two distinguished-service awards made annually by the Texas Mid-Continent Oil and Gas Association.

"I had worked on a Magnolia pipeline gang in the summer while going to school," Gladney recalls, "and was promised a job when I got out." But when he went to apply, the first man he met was his brother, who already was well up the ladder in Magnolia's pipeline organization.

"He told me that if I did well with Magnolia, everyone would say he was pushing me; if I did poorly, they'd say he was keeping me on the payroll. In brief, he said he'd be just as happy if I went to work somewhere else."

First a clerk . . . Sun was just opening its Dallas office, and Gladney got a job as a clerk. This was in 1919. Soon he was a paymaster, moving on to become field auditor in charge of warehouses, scout, and lease buyer at Mexia, Tex., and El Dorado, Ark., and superintendent of production for Arkansas and North Louisiana.

Wherever he went, his associates found Gladney to be an ardent fisherman, bird hunter, and golfer—in spite of the fact he had lost a leg as a result of a football injury and spent nearly a year in the hospital.

That was in 1917. Gladney was a student at Texas Military College and was playing football for Trinity University, then at Waxahachie. In the Trinity-Baylor game, Gladney broke his right leg. The injury later resulted in amputation, and Gladney was on crutches in 1919 when he went to work for Sun.

In 1930 he was transferred to Tyler as district land superintendent. He served on the first voluntary proration committee in East Texas and later helped to create East Texas Salt Water Disposal Co., of which he is still a director and member of the executive committee.

In 1939 he became assistant manager of the land department, and 8 years later assistant manager of the southwest division. He was made an assistant secretary of Sun Oil in April 1951, and only a month later was named general manager of the southwest producing division.

Gladney still fishes "just about every week," mostly at the Koon Kreek Klub lake 100 miles east of Dallas. He'll tell you readily about the 8½-lb. bass he caught on a fly rod and even more readily about the 9½-pounder a friend caught just after borrowing Gladney's rod.

Now 57, he still makes an annual trip to Mexico during white-wing season and still does a little quail shooting. "Since I've about quit hunting quail," he says, "I've starting raising them." He now has between 3,000 and 4,000 growing Bob Whites and Tennessee Reds.

No more golf . . . His golf is a thing of the past. But in the Dallas Petroleum Club there's a club-champion's cup, a little tarnished after 15 or so years, which attests to Gladney's former ability. There's a record somewhere, too, of the fact that some years earlier he won the Sun Oil Co. championship in a tournament in Tulsa.

Gladney is quite modest about the years of accomplishment which led to his award. "It was a lazy committee," he'll tell you. "They just didn't go very far down the list of names." And if you ask how a clerk and paymaster happened to become a production executive, he'll reply: "Well, I just got started before there were any engineers."

Gustav Stolz, former junior research engineer with Stanolind Oil & Gas Co., has resigned to join the faculty of Montana School of Mines at Butte.

Robert C. Randle, of Magnolia Petroleum Co., has been transferred from Brownfield, Tex., to Houston and promoted to assistant division engineer.

John H. Wilson, a University of Oklahoma petroleum engineering graduate, has been appointed vice president and general manager of Okalta Oils, Ltd., at Calgary.

W. W. Bredlow, superintendent of the Moorhead, Minn., products pipeline terminal of Standard Oil Co. (Ind.), has been transferred to Superior, Wis., as superintendent of the marine terminal there. His successor is **K. L. Emery.**

DR. J. E. WHITE

Dr. James Edward White has been appointed supervisor of the physics section of Ohio Oil Co.'s research center, now under construction at Littleton, Colo., near Denver. Other research department heads are **Dr. R. Dana Russell,** geology section; **Dr. Louis C. Gibbons,** chemistry section; and **Dr. Fred H. Poettman,** engineering section.

R. W. Watchous has resigned as vice president of Rocket Drilling Co. to become an independent operator and consultant at Wichita, Kans.

C. C. (Charlie) Small, Jr., former drilling superintendent for Falco Drilling Co., Alice, Tex., has joined Continental Oil Co. as drilling foreman in Louisiana offshore operations.

John P. McNaughton, assistant vice president of Neville G. Penrose, Inc., has been promoted to vice president. McNaughton, who joined Penrose in February 1953, served with Gulf Oil Corp. as an engineer from 1946 to 1952. During 1952-53, he was a member of Petroleum Administration for Defense.

C. B. Ammann, engineer in the production department for Sinclair Oil & Gas Co., has been transferred from Chase, Kans., to Tulsa. **H. H. Weinland,** engineer at Drumright, was transferred to Chase. **E. G. Cole,** division geologist at Fort Worth, was trans-

PERSONALS

ferred to the New York office of Sinclair. Other changes include **W. D. McEachin,** district geologist, Midland, Tex., promoted to division geologist, Fort Worth; **E. L. Runyan,** district geologist, Ardmore, Okla., transferred to Wichita Falls, Tex.; **A. A. Koenig, Jr.,** district geologist, Albuquerque, N. M., promoted to district manager; and **Leon R. Volterre,** junior geologist, Tulsa, transferred to New Orleans.

William H. Dalton has been appointed general manager of the Canadian Gas Association. The association is composed of gas companies from British Columbia to the Maritimes.

J. S. LEONARD

J. S. Leonard, assistant division manager at Casper, Wyo., for Ohio Oil Co., has been promoted to manager of the Tulsa division office. He succeeds Edward B. Stewart, who died September 10. Leonard joined Ohio as a geologist in 1930. He later served as production superintendent in Mexico, district geologist at Hobbs, N. M., and Bay City, Tex., superintendent of Ross Ranch field in Texas, rotary drilling foreman at Reed City, Mich., drilling superintendent at Houston, and district manager at Sydney, Neb. **N. E. Trumbull,** division superintendent at Terre Haute, Ind., has been named assistant division manager at Casper to succeed Leonard. **J. H. Shonk,** assistant division superintendent at Terre Haute, succeeds Trumbull.

N. E. TRUMBULL

J. H. SHONK

Fred S. Jensen, formerly associated with The Texas Co., has been named regional geologist for Halbert & Jennings, Denver oil firm. Jensen served with the U.S. Geological Survey in the North Dakota and Montana sections of the Williston basin from 1946 to 1951. He then joined Texaco and served in various capacities until he resigned September 1.

M. E. Banks, district superintendent for Humble Pipe Line Co., at Odessa, Tex., has been transferred to Mexia, Tex.

R. Woody Paul has resigned from Petroleum, Inc., to open offices as an independent consulting geologist at Liberal, Kans. He formerly was associated with Cities Service Oil Co.

Walt W. Clements has been appointed manager of operations in the Kansas-Oklahoma district for Artnell Co., with offices in Wichita.

Jack Levering, former vice president of Onyx Refining Co. in Abilene, Tex., has resigned from Onyx to concentrate on personal oil interests in Abilene. His successor is **Kelly Martin.**

Nelson B. Potter, former Bay Petroleum Corp. geologist at Abilene, Tex., has been transferred to Denver as geologist with Tennssee Gas Transmission Co., which purchased Bay.

Albert H. Hedden has resigned as West Texas division exploration geologist for Humble Oil & Refining Co. at Midland, Tex., to open offices as consulting geologist there.

A. W. Goodwin, chemical engineer for American Oil Co. at Texas City, Tex., has been promoted to head of the economics section of the research and development department.

Dr. Vladimir Haensel has been elevated to director of refining research for Universal Oil Products Co. at Des Plains, Ill. Other appointments include **Dr. Herman S. Bloch,** deputy director of refining research; **Dr. J. A. Chenicek,** director of chemical research; and **Dr. M. J. Murray,** director of physics research.

W. F. Ross has been named head of Shell Development Co.'s petroleum refining department at the Emeryville Research Center, succeeding **S. A. Ballard,** now associate director of research in chemical products. **C. G. Clear** succeeds Ross as head of the lubricants general department at Emeryville. **H. K. Sutherland** succeeds Clear as assistant manager of the Shell Oil Co. manufacturing organization's head office technological department. **John Anderson,** former research director of Shell Chemical Corp.'s Houston Research Laboratory, has been named research director at the Torrance Research Laboratory. Anderson will work on synthetic rubber. **E. B. Underwood, Jr.,** assistant chief engineer at Shell Oil Co.'s Martinez refinery, has been transferred to the Wood River refinery in the same capacity. **H. H. Scott,** senior engineer, is Underwood's successor at Martinez.

D. M. Morrison, M.B.E., has been elected president of Trans Mountain Oil Pipe Line Co. Morrison had been serving as vice president of manufacturing of Shell Oil Co. of Canada, Ltd. Morrison joined Shell 28 years ago and has held a number of increasingly important positions in the firm's refining organizations in both Canada and the U.S. From 1942 to 1944, Morrison served with the department of munitions and supply in the explosives and chemicals division. He received the M.B.E. for his outstanding wartime work.

Erskine E. Roach, petroleum engineer with Stanolind Oil & Gas Co., has been transferred from Tulsa to Houston.

James G. Glass, petroleum engineer for Midstates Oil Corp., has been transferred from New York to Tulsa.

Leonard C. Smith, petroleum engineer with Standard Oil Co. of California, has been transferred from Taft to Bakersfield, Calif.

Clifford R. Horn, gas supply engineer for Panhandle Eastern Pipe Line Co. at Kansas City, Mo., has been promoted to superintendent of gas supply and transferred to Liberal, Kans.

Cecil C. Martin, former process engineer with Johnson Oil Refining Co. at Cleveland,, Okla., has moved to El Dorado, Ark., to become process engineer for Lion Oil Co.

W. A. Paterson, Jr., Signal Drilling Co. drilling engineer at Casper, Wyo., has been named drilling engineer for Pennant Drilling, Ltd., an affiliated company, at Calgary.

F. B. Neptune has been promoted from acting manager to manager of products pipelines and terminals of Phillips Petroleum Co.'s supply and transportation department. Neptune joined Phillips in the research and development department in August 1931.

PERSONALS

Earl H. Renfro has organized Renfro Drilling Co., Wichita.

Lars C. Jensen, Nebraska division coordinator for Service Pipe Line Co., has been transferred to the Kansas division with headquarters in Wichita.

Walter A. Shulaw, petroleum engineer for Magnolia Petroleum Co., Falfurrias, Tex., has been transferred to Lake Charles, La.

Charles Leet, general manager of East Coast manufacturing activities of Esso Standard Oil Co., has been elected a director of Creole Petroleum Corp. and will join the company in Venezuela at the end of the year. Leet has been assistant manager of Esso's Baton Rouge plant and manager of the Bayonne, N. J., refinery.

Alex W. McCoy III, of Alex W. McCoy Associates, Inc., and **Herman H. Kaveler,** Tulsa petroleum engineering and management consultant, have announced a joint consulting service for appraisal evaluation, development, and management of petroleum properties. McCoy was associated with Gulf Oil Corp. before forming his own firm in 1953. Kaveler was with Phillips Petroleum Co. before he entered private business in 1952.

C. W. REHFUSS

Carl W. Rehfuss has been appointed general manager of Standard Oil Co. of California's Richmond, Calif., refinery, the largest on the West Coast. Rehfuss succeeds **R. K. Rowell,** who has been general manager since 1945. Rehfuss, previously assistant general manager of the plant, has been with California Standard since 1924. He has been on the management staff at Richmond since 1940 and has also had experience at the firm's El Segundo, Calif., plant. **M. F. Miller,** who has been serving as manager of operations at Richmond, has been promoted to succeed Rehfuss. **T. M. Sheehy** has been moved up to succeed Miller.

Jack E. McKenna has been named to the staff of the department of technical services of the American Petroleum Institute. McKenna has been assigned to the safety and fire protection services. McKenna was an active member of several A.P.I. safety and fire protection committees in his former capacities as safety director of Lion Oil Co. and Aurora Gasoline Co. successively.

J. C. Scherer, division petroleum engineer with Union Pacific Railroad Co., has been transferred from Wilmington, Calif., to Rock Springs, Wyo.

Lee E. Boyter, measurement engineer with Trunkline Gas Co. at Longville, La., has been promoted to assistant superintendent of measurement and transferred to Houston.

V. Fred Kestner, former area superintendent for Sun Pipe Line Co. at Longview, Tex., has been transferred to Lafayette, La., as area superintendent for the Louisiana area operations.

William H. Kleckner, petroleum engineer with The Texas Co. at New Orleans, has been assigned to Australian operations by California-Texas Oil Co., Ltd.

Joseph L. Cahill has been named senior project engineer with Fish Engineering Co. Cahill is working on an ammonia plant to be built in the State of Washington by Phillips Pacific Chemical Co. Before joining Fish, Cahill was with Engineering Associates, of Houston.

Horace P. Goodrich, manager of Drilling & Exploration Co.'s Southwest division at Midland, Tex., has been named new chairman of the Permian Basin Chapter of the American Association of Oilwell Drilling Contractors. Outgoing chairman is **E. G. Durrett,** Delta Gulf Drilling Co.'s Permian basin division manager at Odessa, Tex. Other new officers are: **Jack Haberlein,** of Schoenfeld-Hunter-Kitch Drilling Co., Odessa, vice chairman; and **Douglas B. Wright,** of Carl B. King Drilling Co., Midland, secretary-treasurer.

S. A. Williams, Jr., has been promoted to senior research chemist at Magnolia Petroleum Co.'s field research laboratories at Dallas. Williams has been with the Magnolia research department since January 1953 and has been working recently on economic problems of drilling-mud technology. **W. F. Baldwin,** who joined the Magnolia Petroleum field-research staff in October 1946, has been promoted to senior research electrical engineer. Baldwin's assignment involves design, construction, and use of electric analog reservoir models to study behavior and performance of petroleum reservoirs.

J. A. Andruske, reservoir engineer with Phillips Petroleum Co., has been transferred from Houston to Alvin, Tex., as district reservoir engineer.

Albert S. Baptie, former executive assistant with Shell Oil Co. at Los Angeles, has resigned to open offices as a petroleum engineer at Long Beach.

William David Tutten, Phillips Petroleum Co. geologist at Bartlesville, Okla., has been transferred to Denver.

D. D. LyBarger, reservoir engineer for Sohio Petroleum Co. has been transferred from Great Bend, Kans., to Oklahoma City.

Rand Larson has resigned a position with Kerr-McGee Oil Industries, Inc., to join Carl B. King Drilling Co., Midland, Tex., drilling contractor, as drilling superintendent of the company's new Gulf Coast division on the Texas and Louisiana Gulf coasts. The new division office will be at Lafayette, La. **H. G. Hill** and **Bert J. Crippen** have been named rig superintendents in the new division.

DEATHS

Fridolf E. Swenson, 55, president of Statex Petroleum Co., of Midland, Tex., died September 15 while vacationing at Gunnison, Colo. Swenson became president of the firm in 1951. Before, he had served as land manager and assistant to the vice president of exploration of Deep Rock Oil Corp., of Tulsa.

Temple B. Hoffer, 70, Texas independent operator with holdings in McAllen, Wichita Falls, and Fort Worth, died recently at his home in Houston.

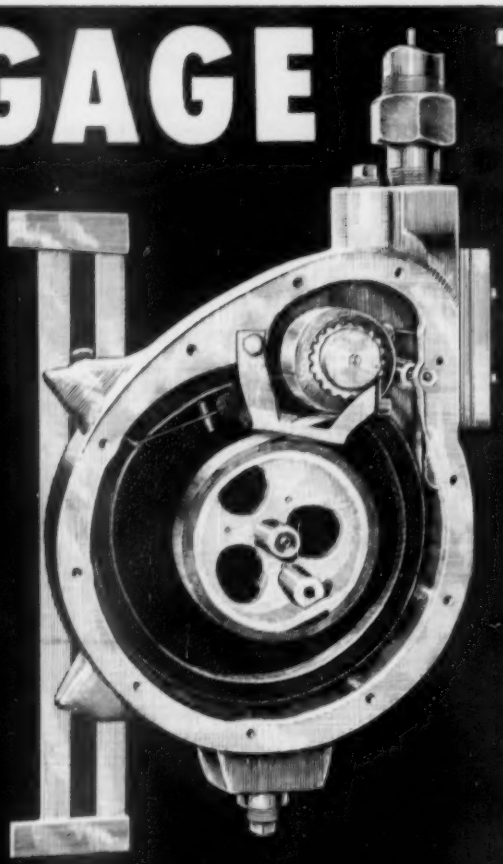
Abe Snyder, 73, pioneer Ohio and Michigan drilling contractor and producer, died recently at his home in Lancaster, Ohio.

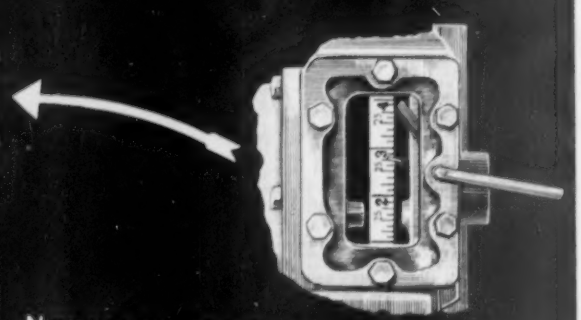
Calvin L. Hay, 47, Midland, Tex., independent oil operator, died September 19 in Midland.

Oscar H. Ahnberg, 77, retired executive of Shell Oil Co.'s production department and vice president of R. T. Collier Corp., died September 16 at his home in Arcadia, Calif.

L. A. Helms, 57, independent operator, was killed recently in an oilfield accident near Custer, S. D.

GAGE TO A "CAT'S WHISKER"





Now you can gage tank contents with greater accuracy and greater dependability, over a longer period of time, with the new Shand & Jurs Fig. ST-8000 Automatic Tank Gage. This new S&J gage incorporates a Neg'ator motor that eliminates counterweight and cable assembly. The design provides one gage to serve all tanks up to 65' in height and maintains constant tape tension throughout float travel, thus delivering "cat's whisker" accuracy at all liquid levels.

The minimum fatigue life of the S&J ST-8000 Automatic Tank Gage is 13,000 cycles, equal to up and down twice a day for nearly twenty years. Bearing loads have also been materially reduced.

The new S&J Fig. ST-8000 gage is also provided with a new, easy to read, hi-visibility tape. It is installed closer to the reading window, thus reducing chances of reading errors. The gage head is equipped with large, adjustable mounting bracket that accommodates full length of the slip joint, providing quick, easy installation and adjustment of the gage at convenient eye level. For complete information on the new S&J Fig. ST-8000 Automatic Tank Gage write the factory or nearest branch listed below for bulletin ST-8000-55.

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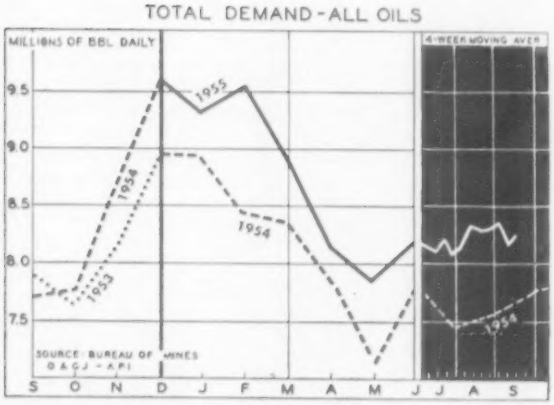
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1.
Whessoe, Ltd., Works: Darlington, County Durham

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,682,900	UP	6,950	UP	500,745
Crude stocks	255,645,000	DOWN	3,717,000	DOWN	17,692,000
Completions	1,095	UP	23	UP	177
Refinery runs	7,471,000	DOWN	79,000	UP	502,000
Gasoline stocks	152,165,000	DOWN	2,172,000	UP	378,000
Distillate stocks	141,229,000	UP	3,393,000	UP	17,208,000
Residual stocks	46,700,000	DOWN	411,000	DOWN	10,568,000
Four-product stocks	375,820,000	UP	935,000	UP	5,100,000
Total imports	976,900	DOWN	149,100	UP	102,900



Middle-Distillate Stock Gain This Year Is at About Postwar Average

MOST suppliers agree that kerosine and distillate markets would be firmer if stocks were a little lower, but inventory statistics seem to indicate that as much of the current uneasiness is due to talk about excess burning-oil stocks as to the actual surplus itself. Stocks may be a little high, but the problem still could be solved by a moderate reduction in refinery runs over the next 6 weeks.

The accompanying table shows yearly changes in both gasoline and middle-distillate stocks, measured at the end of October. The increases for 1955 are based on a forecast of 188,000,000 bbl. of middle distillate and 160,000,000 bbl. of gasoline in storage on October 31. If you think these are too high or too low, use your own estimate and compare this year's changes with increases for other postwar years.

Using the above estimates for October stocks, the gain in middle distillate this year is just about in line with the postwar average of 11,600,000 bbl. On the other hand, the increase in gasoline stocks may exceed the postwar average.

Gasoline stocks at the end of June of this year were 8,000,000 bbl. less than a year earlier but were 1,000,000 bbl. over last year by September 9. Gasoline stocks were on the downgrade during the last half of 1954 and were actually less at the end of December than at the end of July.

On the other hand, the increase in middle-distillate stocks during the month of October last year was the largest on record. Also, stocks were very low at the end of the heating season this year, only 2,800,000 bbl. above either 1954 or 1953. Rapid replacement of these stocks during the summer months was to be expected. All of these facts indicate that direct comparisons between 1955 and 1954 may be misleading.

Despite the lack of proof in figures, there is an element of danger in the current stock situation. So much has been said and written about excessive middle-distillate inventories this year that there is some chance that suppliers may became panicky and start dumping material on the spot market at a time when such action could cause a price break that would mean the difference between a profit and a loss for some refiners. Because of this possibility, some reduction in refinery runs seems advisable.

There may be a plus value in the publicity given to distillate inventories. Reports of surplus distillate stocks may delay the normal seasonal shift in refinery yields to greater production of heating oils from each barrel of crude. But, unless this delay is accompanied by a reduction in refinery runs, it could mean an abnormal increase in gasoline stocks.

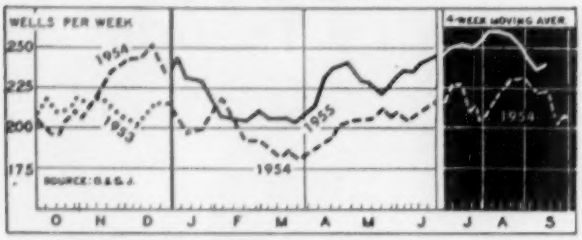
Since crude stocks are at the lowest level since early 1952, there is plenty of room in crude tanks for any buildup of crude stocks that would result from a reduction in refinery runs.

CHANGES IN CLEAN-PRODUCT STOCKS—ANNUAL CHANGES AS OF OCTOBER 31
(Thousands of barrels)

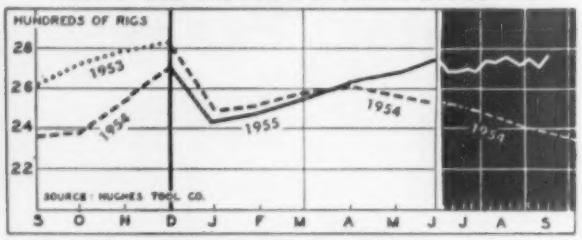
	Gasoline	Middle distillate	Total clean products
1948	9,800	23,200	33,000
1949	10,900	9,000	19,900
1950	2,500	—4,300	—1,800
1951	3,000	22,000	25,000
1952	1,200	8,700	9,900
1953	24,400	19,600	44,000
1954	7,200	3,300	10,500
1955*	10,400	11,700	22,100
Average annual increase	8,700	11,600	20,300

*Based on forecast of 188,000,000 bbl. of middle distillate and 160,000,000 bbl. of gasoline in storage on October 31.

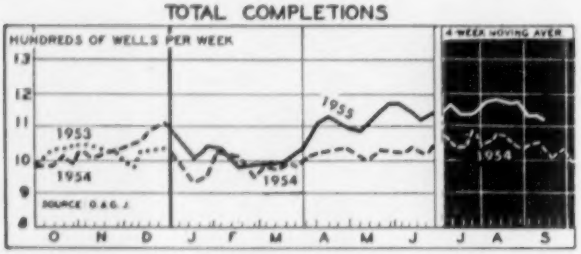
WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



TOTAL COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	9-19-55	Change from 9-12-55	Change from 9-20-54
Gulf Coast	623	12	110
N. and W. Texas-New Mexico	906	71	173
Arkansas-N. Louisiana-E. Texas	173	4	—14
Oklahoma	331	12	49
Kansas-S. Nebraska	197	7	33
Illinois-Eastern	131	—10	—17
Rocky Mountain	294	—12	49
Pacific Coast	127	— 4	1
Total United States	2,782	80	384
Western Canada	221	4	100

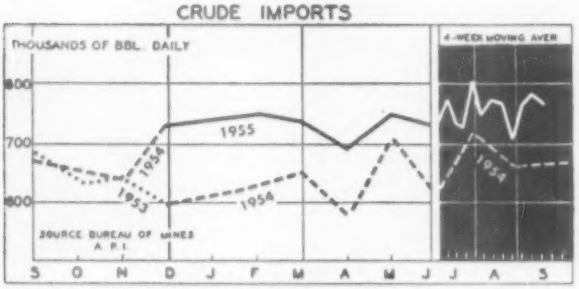
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 17, 1955

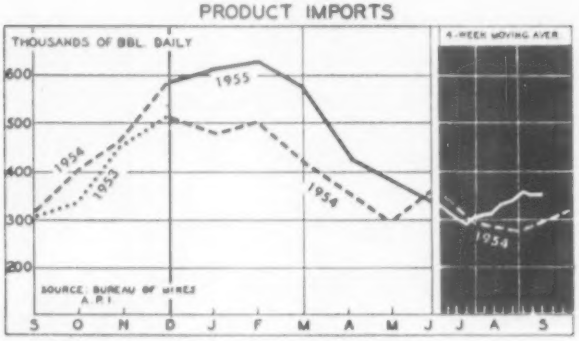
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	6,589	58	79	0	0	0	1	1	0	0	0	56	56
Arkansas	23	17	0	6	62,056	563	425	0	0	0	1	1	25	1	2	122	150
California	50	37	0	13	239,843	1,748	1,692	0	0	0	8	8	31	0	7	299	337
Colorado	29	11	1	17	151,449	1,050	933	0	0	1	12	13	35	0	22	532	589
Illinois	63	41	0	22	157,636	2,695	1,998	0	0	0	7	7	44	0	4	379	427
Indiana	19	9	1	9	36,209	536	577	0	0	0	6	6	8	0	0	213	221
Kansas	92	48	6	38	335,948	3,574	3,210	3	0	1	18	22	107	1	28	573	709
Kentucky	55	30	4	21	70,237	1,054	795	1	0	0	10	11	42	0	9	210	261
Louisiana	67	38	2	27	490,893	2,797	2,453	2	2	1	13	18	81	57	22	314	474
North	28	19	1	8	79,586	1,449	1,323	0	0	1	3	4	16	5	3	129	153
South	39	19	1	19	411,307	1,348	1,130	2	2	0	10	14	65	52	19	185	321
Michigan	15	3	3	9	54,567	378	400	0	0	0	6	6	7	0	1	145	153
Mississippi	11	4	0	7	83,672	320	282	0	0	0	5	5	13	0	0	108	121
Montana	14	6	0	8	62,277	246	219	2	0	0	8	10	9	0	1	85	95
Nebraska	22	7	0	15	129,083	583	301	1	0	0	10	11	34	0	0	236	270
New Mexico	46	18	19	9	181,114	1,194	785	2	0	0	3	5	31	2	8	89	130
Northwest	25	3	19	3	95,409	393	280	2	0	0	1	3	4	1	8	27	40
Southeast	21	15	0	6	85,705	801	505	0	0	0	2	2	27	1	0	62	90
North Dakota	5	3	0	2	28,206	176	208	1	0	[8]	2	3	4	0	0	41	45
Ohio	20	13	3	4	40,064	845	821	0	0	0	0	0	3	0	5	15	23
Oklahoma	139	66	7	*66	526,662	6,061	6,449	3	0	0	20	23	102	11	21	471	605
Pennsylvania-New York	18	4	8	16	49,925	1,130	1,688	0	0	0	0	0	0	0	7	10	17
Texas	379	234	17	128	1,631,990	14,341	13,174	15	0	4	79	98	562	77	100	2,944	3,683
Southwest (1 & 4)	71	43	2	26	331,979	2,202	1,882	6	0	1	17	24	84	25	31	551	691
Gulf Coast (2 & 3)	45	27	3	15	296,110	1,797	1,874	4	0	1	8	13	67	42	31	476	616
East (5 & 6)	20	7	6	7	102,886	696	687	1	0	0	4	5	21	4	8	238	271
North Central (7-B & 9)	137	65	1	71	389,461	5,411	4,967	2	0	1	44	47	278	0	11	1,171	1,460
West (7-C & 8)	67	62	0	5	359,270	3,489	3,050	1	0	0	4	5	108	1	10	483	602
Panhandle (10)	39	30	5	4	152,284	746	714	1	0	1	2	4	4	5	9	25	43
Utah	0	0	0	0	0	67	51	0	0	0	0	0	6	0	4	42	52
West Virginia	16	1	12	3	40,629	450	416	0	0	0	0	0	0	0	9	12	21
Wyoming	10	7	0	3	55,573	596	917	0	0	0	1	1	16	0	5	137	158
Miscellaneous (S. D.)	1	0	0	1	2,602	23	93	0	0	0	1	1	0	0	1	18	19
Total United States	**1,095**	597	83	415	4,437,224	40,485	37,966	30	2	7	211	**250**	1,160	149	256	7,051	8,616
Total previous week	1,072	556	71	445	4,287,003			36	1	6	189	232	1,130	147	249	6,840	8,366
Total September 18, 1954	918	503	74	341	3,558,899			17	1	11	144	173	1,024	101	283	6,342	7,750
Western Canada	55	44	1	10	203,294												

Service wells included: *8, †2.

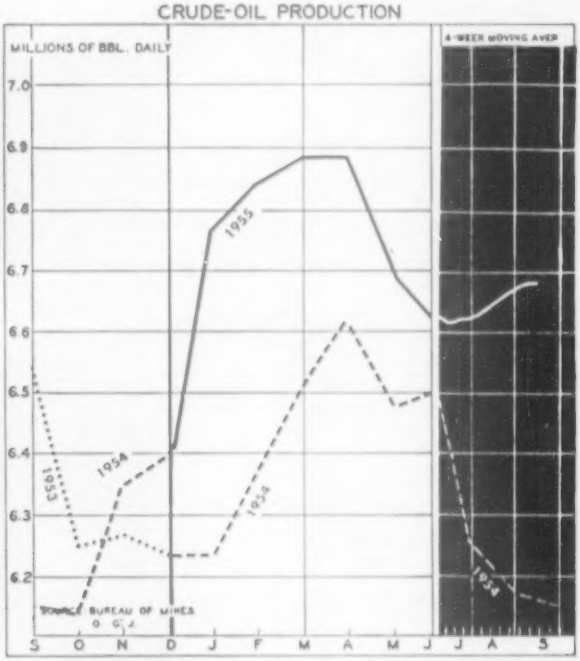
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



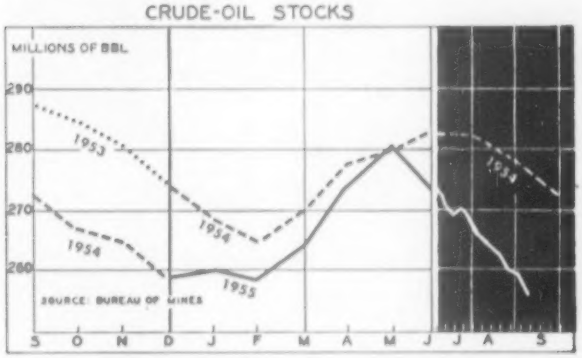
DAILY AVERAGE PRODUCTION FOR WEEK

	September 17			Sept. 10
	Crude oil	Lease condensate	Total	total
Alabama	4,100		4,100	3,900
Arkansas	74,750	400	75,150	73,700
California	980,500		980,500	978,000
Colorado	149,800		149,800	147,500
Eastern	50,800		50,800	50,800
Florida	1,350		1,350	1,350
Illinois	242,700		242,700	239,800
Indiana	29,500		29,500	31,000
Kansas	310,900		310,900	313,100
Kentucky	43,700		43,700	44,200
Louisiana	691,500	58,100	749,600	748,300
North	114,500	3,100	117,600	116,300
South	577,000	55,000	632,000	632,000
Michigan	31,900		31,900	30,200
Mississippi	100,000	4,200	104,200	104,200
Montana	43,800		43,800	45,900
Nebraska	30,300		30,300	29,600
New Mexico	227,700	3,100	230,800	231,100
North Dakota	34,900		34,900	36,100
Oklahoma	535,500		535,500	531,800
Texas	2,700,000	47,500	2,747,500	2,747,500
Dist. 1	49,600	450	50,050	50,050
Dist. 2	138,000	7,550	145,550	145,550
Dist. 3	404,000	22,800	426,800	426,800
Dist. 4	232,000	5,025	237,025	237,025
Dist. 5	49,800	375	50,175	50,175
Dist. 6	119,500	4,625	124,125	124,125
East Texas field	207,100		207,100	207,100
Dist. 7-B	146,000	50	146,050	146,050
Dist. 7-C	166,000	4,100	170,100	170,100
Dist. 8	902,000	2,000	904,000	904,000
Dist. 9	196,000	375	196,375	196,375
Dist. 10	90,000	150	90,150	90,150
Utah	6,500		6,500	6,600
Wyoming	279,200		279,200	281,000
Others	‡200		‡200	300
Total U. S.	6,569,600	113,300	**6,682,900**	6,675,950
Change from previous week, up			**6,950**	
Canada	†364,525		†364,525	†356,825

Total U. S. production January 1-September 17 1,752,159,850 bbl.
Same period last year (crude plus cond.) *1,657,597,505 bbl.

*Includes 25,387,700 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 100.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

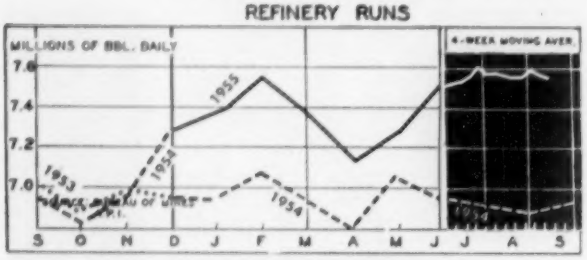
(Thousands of barrels)

	9-10-55	9-3-55	9-11-54
Pennsylvania Grade	3,173	3,173	3,045
Other Appalachian	1,853	1,978	1,526
Illinois, Indiana, Michigan	10,202	10,405	12,224
Nebraska, North Dakota	2,090	2,155	(‡)
Kansas	7,987	8,287	9,991
Oklahoma	21,815	21,936	24,408
Arkansas	2,929	2,574	3,207
Louisiana	15,409	16,232	15,526
North	2,500	2,608	2,593
South	12,909	13,624	12,933
Mississippi	2,850	2,866	2,803
New Mexico	7,625	7,925	8,692
Texas	118,753	119,944	129,668
East Texas proper	9,457	9,687	10,867
West Texas	55,470	56,124	57,409
Texas Gulf	23,775	23,392	26,135
Other Texas	30,051	30,741	35,257
Wyoming	15,091	15,380	12,316
Other Rocky Mountain	5,122	5,211	5,835
California	28,909	29,651	33,207
Foreign	†11,837	‡11,645	10,889
Total	255,645	‡259,362	273,337

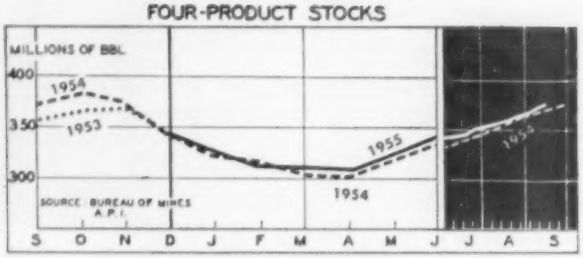
*Bureau of Mines. †Includes 3,624,000 bbl. in California. ‡Included with Kansas. ‡Revised.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

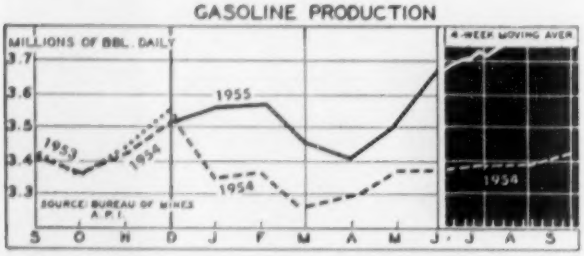
REFINERY RUNS



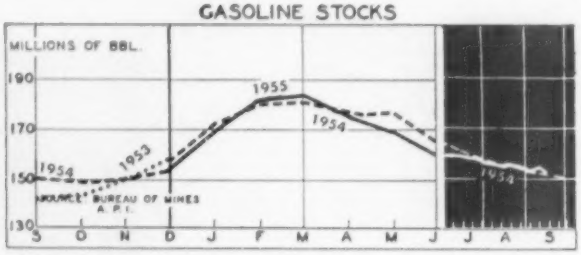
FOUR-PRODUCT STOCKS



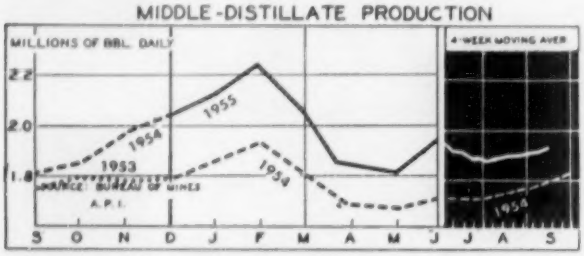
GASOLINE PRODUCTION



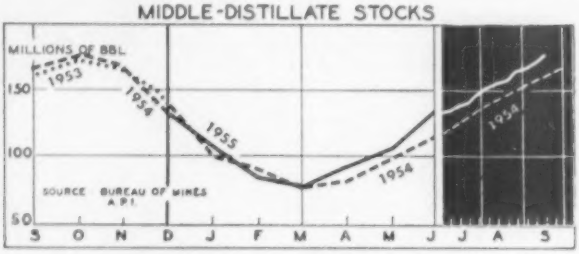
GASOLINE STOCKS



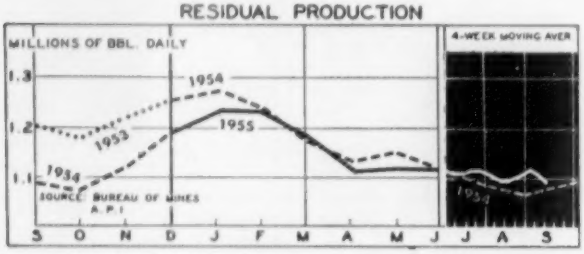
MIDDLE-DISTILLATE PRODUCTION



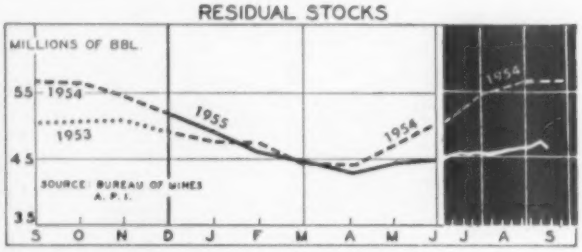
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



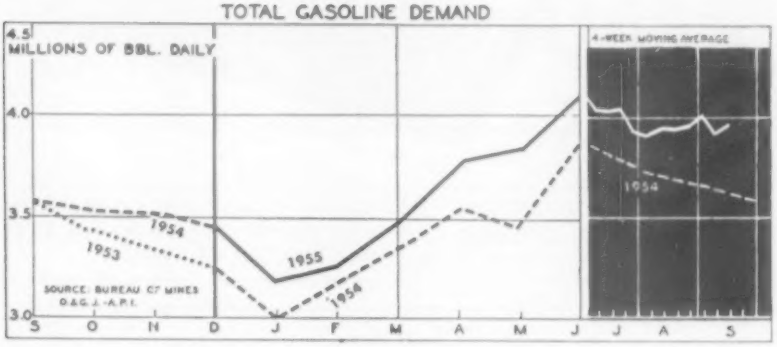
A.P.I. REFINERY REPORT, SEPTEMBER 16

(Thousands of barrels)

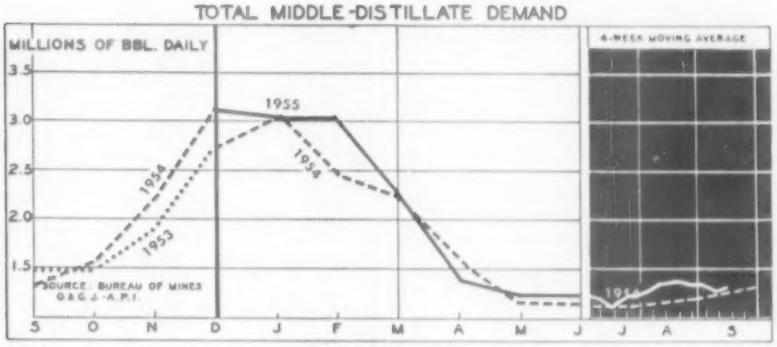
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1954 — Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,067	431.9	35.9	245.6	175.7	34,722	13,948	51,625	12,894	1,032	447.4	32.9	276.3	191.1
Appalachian:														
District 1	96	42.2	4.1	19.3	8.6	3,919	689	3,006	491	105	48.7	3.9	22.4	6.5
District 2	101	58.7	1.4	14.6	13.6	2,451	606	1,087	433	70	36.2	3.1	10.1	6.5
Ind., Ill., Ky.	1,265	678.0	43.6	260.7	136.6	31,037	9,395	27,508	4,707	1,220	660.4	57.5	247.0	133.1
Okla., Kans., Mo.	717	417.4	21.6	171.0	39.9	15,006	2,450	15,280	1,338	592	334.5	16.2	137.5	43.1
Inland Texas	264	192.1	23.1	55.1	21.3	5,352	472	2,753	1,276	236	174.8	8.7	42.2	23.5
Texas Gulf Coast	1,799	856.4	95.9	446.9	224.3	20,821	3,728	15,255	7,241	1,728	810.6	113.5	411.4	236.0
La. Gulf Coast	660	351.3	51.7	171.9	42.1	9,079	2,614	6,099	1,491	568	306.3	49.9	153.9	43.0
N. La. and Ark.	97	36.1	11.0	22.0	4.1	3,981	1,086	2,234	69	87	34.7	6.4	20.8	6.1
Rocky Mountain:														
New Mexico	18	8.7		2.0	2.0	227	8	71	41	20	11.7	0.6	3.4	3.2
Other Rocky Mtn.	261	127.7	3.4	61.1	38.3	5,447	390	3,020	929	250	114.7	4.1	57.4	35.9
California	1,126	507.2	7.9	173.1	342.4	20,123	340	13,291	15,790	1,031	440.4	3.8	131.4	357.7
Sept. 16, 1955	7,471	3,707.7	299.6	1,643.3	1,048.9	152,165	35,726	141,229	46,700	6,939	3,420.4	300.6	1,513.8	1,085.7
Sept. 9, 1955	7,554	3,739.1	298.4	1,650.9	1,093.7	154,337	35,601	137,836	47,111					
Sept. 17, 1954	6,969	3,407.4	330.4	1,435.3	1,101.0	151,787	37,644	124,021	57,268					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

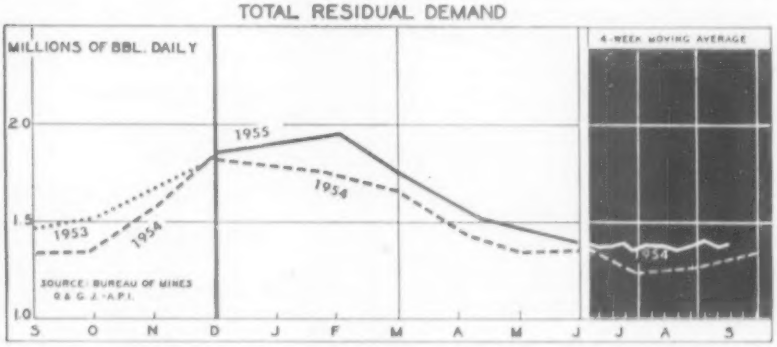
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of September 21, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11-11.25	11.5-12	10.5-10.75
Premium gasoline	12.25-12.5	13-13.75	12-12.25
42-44 w.w. kerosine	9.25-9.50	10.3	8.75-9.00
No. 2 straw fuel oil	8.25-8.50	9.55	8.5-8.75
No. 6 residual	$1.75-1.85	$2.55-2.75	$2.10-2.20

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18-19
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Socony Mobil Oil Co. raised gasoline prices in its marketing territory but reported that wholesale prices would remain depressed in some of the price-war areas. Some discounts off postings for light heating oils in New York Harbor have been reported. Natural gasoline is very strong on Group 3 market.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 9-16-55	3,747	3,973
June 1955	3,643	4,112
August 1954	3,391	3,649
September 1954	3,420	3,586
Middle distillate:		
Four weeks ended 9-16-55	1,934	1,302
June 1955	1,898	1,235
August 1954	1,755	1,197
September 1954	1,815	1,370
Residual fuel:		
Four weeks ended 9-16-55	1,090	1,390
June 1955	1,080	1,457
August 1954	1,069	1,258
September 1954	1,086	1,319

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, July 11, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.60
Middle District	3.47
Southwest Pennsylvania	3.18
West Virginia	3.07
Buckeye Grade	3.01
Zanesville Grade	2.82
Illinois Basin	2.90

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UNDISPLAYED CLASSIFIED 25c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

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Address Classified Advertising Material: The Oil and Gas Journal, P. O Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE: Steam Rotary Rig, 2 Oil Well Supply Twin Engines, Wilson Snyder Pump, Other drilling equipment. For complete inventory write Box 49, Carlsbad, New Mexico.

#12-PE 94' EMSCO Galvanized Bolted Type 437,000# capacity portable drilling mast with 7' high x 38' long pin type substructure, 3 years old, A-1 condition, $8,800. Contact E. L. Lambert, Iverson Supply Company—Phone Davis 5-2836, Farmington, New Mexico.

FOR SALE: Near Castle, Oklahoma, National Tanks, like new. 1—210 Gun Barrel, 1—200 Stock. Call or write Rogers & Lundquist Pipe & Supply, Box 9665, Tulsa, Okla., phone, Hickory 6-6528.

WILSON Giant ROADAIR Rig, excellent condition. Complete (Less Drill Pipe) with 131 ft. Moore mast, 2—12 LeRois and 16 inch G-D Pump. Operating west of Casper. Price $90,000.00—terms. GEHRING EQUIPMENT CO., Ph. 2-5341—Casper, Wyo.

ROTARY RIG

National T-16 Drawworks w/Twin 6-71 GMC Motors, 7¼"x12" Gardner-Denver Pump w/Twin 6-71 GMC Motors. 96' LCM Mast, 4900' 4½" 16.60# Drill Pipe used approx. 20,000', plus Complete Equipment; Inventory on request.

Box J-144, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

Butane & Propane Storage

Location Andrews Co.
Texas

1—17,000 gal. PROPANE TANK, 200 lbs. W.P.

1—12,000 gal. PROPANE TANK, 225 lbs. W.P.

2— 7,300 gal. ea. BUTANE TANKS, 150 lbs. W.P.

Excellent Condition

— also —

1—H.F.R. HAPPY FIN TYPE COOLER, COMPLETE—Practically new.

Martinpool Gasoline Company

406 Nash Bldg.
Austin, Texas
Phone 8-3312

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE—3500' highly portable Wilson Rig with double jack-knife derrick and skid base with 7¼ x 10" Gardner-Denver Pump. This rig is working now. Call Jeep Johnson, 411, Cleveland, Okla., or write Box 248.

SMALL SUPEREX gasoline plant, 3 million cu. ft. maximum gas capacity and/or 4,500 gallons gasoline and 4,500 gallons butane-propane daily. Russell Enginering Corporation, P. O. Box 6731, Houston 5, Texas.

LIQUIDATION

COMPRESSOR STATION

4—400 HP IR Type XVG Gas Engine Driven 2 Stage Compressors.

$50,000 New Spare Parts for Above.

2—IR Starting Air Compressors, Model 25C, Type 40, 265#, 67.6 cfm.

TOWERS - COLUMNS

1—7'6" x 65'6", 30 trays, 45# psi.
1—7' x 25'6", 10 trays, 347 S/S, 50# psi.
1—6' x 58' x ½" Chrome-lined, 21 Trays.
1—6'6" x 65' x ⅝", 17 Chrome Decks, 9 Chrome Baffles.
1—6' x 27', 14 trays.
1—5' x 27' x ⅜" Shell, 10 Trays.
1—3'6" x 49' x ⅞" Shell, 28 Trays, 180#.
1—30" x 34'10" x ¼" Shell, 18 Trays.

TANKS - VESSELS

6—1250, 1,000 Bbl. Welded and Bolted. 10—8' x 15', 10' x 20', 6' x 20', 5'3" x 38'6", (Ch. Lin. 90#), 3'10" x 38', (325# 950° F), 7' x 15', 5' x 18'.

HEAT EXCHANGERS

3—Kellogg 2400 sq. ft. Admiralty, 150# psi.
1—Efco Steel Tube 1500 sq. ft., 150# psi.
1—Griscom Russell Admiralty, 742 sq. ft., 150# psi.
3—Struthers-Wells Admiralty, 425 sq. ft., 150# psi.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S/S.
6—470 sq. ft., 850 psig, 550° F., S/S.
13—715 sq. ft. 125 psig, 300° F., S/S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

MISCELLANEOUS

1—Lab Petrochem Isoflow Furnace 50,000 BTU/hr.
1—B.J. Hot Oil Pump 3" x 9", 14 stage, 325 gpm, 4620' head, 11-13 nickel chrome impeller, 400 HP st. turbine.
1—Gould 4" Pump 300 HP, 3550 rpm, 400 gpm at 600' hd.

Partial List Only

WIRE! PHONE! WRITE!

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
Or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

STORAGE TANK. Horizontal 11 x 21 welded ⅜ ends ¼ barrel mounted angle iron cradle, excellent condition. $500.00. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE—Complete Rotary rig, U-10 Drawworks, 7¼ x 14 PHD Pump, both powered by Twin 6 GM 6-71 Motors. 127' Lee C. Moore Mast, 5' base overall, steel flooring, Ideal Type L Swivel, Baash-Ross block, BJ Hook, 4500' 4½" bottleneck drill pipe. Complete with dog house, fuel tank, water tank, light plant, water pump, and all hand tools, now drilling. Box J-118, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE OR LEASE

1—Oilwell No. 96 drilling rig with three LRO Waukesha power units completely equipped for 15,000 ft. drilling. Rig is 2 years old and in perfect condition—located in Mississippi.

WRITE, WIRE OR CALL—

Southern Oilfield Material Company
Room 1107—505 N. Ervay St.
Dallas, Texas
RIverside-1073

FOR SALE:

Refinery equipment located at Winnsboro, Big Sandy, and Mt. Pleasant, Texas. New and used as follows: pumps, bubble towers, tanks, compressors, pipe stills, valves, fittings, control instruments, condenser tubes, still tubes, and still headers.

AMERICAN LIBERTY OIL COMPANY.
Engineering Department,
Box 1011,
Mt. Pleasant, Texas

NEW TRAILERS

DROP—BED "TYPE" $2,731.48
FLAT—BED "TYPE" 2,638.89

Plus 8% Tax

Built To Order

PASKO MACHINERY & STEEL
1721 CHICAGO DRIVE S. W.
GRAND RAPIDS, MICHIGAN

FOR SALE EQUIPMENT

TWIN STEEL gasoline storage tanks 10' x 30' on steel structure. Steel steps and bridge connection. Capacity 20,200 gals. each A-1 condition. Ten Mile Oil and Gas Company, 407 Morrison Building, Charleston, W. Va.

FOR SALE: 3 Type 80 Cooper Twin Gas Engine Driven Compressors rebuilt like new ready to go. Compressor Cylinders to suit. Write or phone W. S. Smith, 205 Thompson Bldg., Tulsa, Okla. LUther 2-5473.

SUBJECT PRIOR SALE boilers all sizes. f.b.-h.r.t. and water tube 50-1000 hp. Special offer 150 hp. 350 lbs.—f.b. units almost new on 12" I.B. skids including all accessories and 2" metal clad insulation. Box H-960, The Oil and Gas Journal, Tulsa, Oklahoma.

Gasoline Plant Equipment For Sale

3—800# 20 MMCF Absorbers with Scrubbers, etc.
2—150 HP 350# WP Lucey Oil Country Boilers Complete with Stacks, etc., and Steel Building.
1—30"x62' Depropanizer with Accumulator, Reboiler and Condenser.
1—36"x50' Stabilizer with Reboiler.
1—12"x40' Demethanizer with condenser and Reboiler.
1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.

Other Equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Phone FAnnin 8103
Fort Worth, Texas

NEW PIPE

DOUBLE RANDOM LENGTHS

O.D.	Wall	Lbs.	Quantity
4½"	.156	.725	30,000 ft.
6⅝"	.219-.250	13-15	20,000 ft.
10¾"	.219	24.60	15,000 ft.
16"	¼"	42.05	8,800 ft.
26"	.288	40 lengths	1,000 ft.
30"	.344	40 lengths	600 ft.

ALL SIZES—NEW AND USED PIPE AND TUBING

IMMEDIATE DELIVERY
Subject to Prior Sale

PHONE—WRITE—WIRE

BROWN-STRAUSS CORP.

1546 Guinotte Kansas City, Mo.
Phone HA 1000

FOR SALE EQUIPMENT

45,000 FEET 3½ O.D. new line pipe 6# T & C, 35c per foot Houston, phone DI 3-3071 Tulsa or write Box 1215, Tulsa.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

WILSON GIANT Air Clutch rig with new type treble Derrick and Heavy Substructure, 71'x14'x14" PHD Heavy Duty Oil Well Pump powered by LRO Waukesha Motor, 5600' of new drill pipe, also miscellaneous equipment to complete Rig. If interested write or call telephone 3489 or Box 647 Coleman, Texas.

JOPLIN Special Drilling Machine and Tools, excellent condition. $2500.00. H. A. Miller, Glasgow, Ky.

FOR SALE—Wichita M Spudder with tools. Will drill 2000 ft. Practically new motor. Burns Oil Company, Box 1098, Shawnee, Okla.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy-Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

NEW—7,980'—2⅞" OD A-4140 Seamless Drill Pipe API-5A Grade with collars. Half price for quick sale.

Contact C. E. Letts,
2714 W. Jefferson Ave.,
Detroit, Mich.
Telephone TAshmoo 5-0345

SAVE MONEY
on
8" LINE PIPE
LAPWELD 8⅝" O.D. 28.55

Very good No. 1 grade, used pipe. Straight 20' single random lengths machine cleaned.
Choice of plain end or T&C. Ideal for oil, water and gas systems, 850 to 900 psi.
Pipe located in Illinois, with low barge, rail and water rates to any part of the world. Priced below market, selling at almost ½ cost of equivalent new pipe.
Will sell for cash or will finance meritorious propositions.

Brokers and agents protected.

REDNEB PIPE CO.
P. O. Box 1798 Shreveport, La.
Phone 2-3276

FOR SALE EQUIPMENT

FOR SALE—near Iola: 60,000' 8" O.D., 11,000' 7" O.D. welded and 5,350' 6" I.D. Naylor coupled pipe. Buried, 24" average cover. To be sold in place. Eastern Kansas Gas Company, Box 408, Iola, Kansas. Telephone 81.

FOR SALE—10,000 feet of New 2⅞" O.D. 10.40# External Upset, Internal Flush, API Seamless Drill Pipe, Grade E. Ends prepared for Reed Super-Shrink Bit Tool Joints. Box H-896, The Oil and Gas Journal, Tulsa, Oklahoma.

L-36 BUCYRUS-ERIE. Completely re-built. Old but better than new, brand new triple-strength mast, casing tackle struts, tripod mast legs making a derrick for safety and pipe pulling. New clutches, levers tightened, motor overhauled, painted. Good drilling line and sand line. Tools from 16" to 4", fishing tools, light plant. $11,000.00 spot cash — a real bargain. Huntington Industries, P. O. Box 3098, Memphis 10, Tenn., Phone—WH 8-0457.

U-10 UNIT RIG, power—2—D13000 Caterpillars compounded. C150 Mud Pump, 96' L. C. Moore Cantilever Type Mast with base, 5'x14'x40' substructure, 4'x7'6"x44'—3 compartment mud tank, Link Belt Shale Shaker, 12½" KW Generator Skidded with XAH Waukesha, 5 KW Kohler spare plant, 4"x40' and 3"x40' Kellys, FE 17½" Ideal Table, Series 900 Shaffer Double Gate, 7'6"x7'x16' Doghouse and Stand. Complete Vapor Proof Lighting System. Complete casing tools, all necessary hand tools, 20' Trailer house. Rig located South Central Wyoming. Inventory sent on request to interested parties. Box J-101, The Oil and Gas Journal, Tulsa, Oklahoma.

8000' 2⅛" O.D. NEW seamless pipe. 20' random lengths 18c. Ideal for structural or transportation. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE: RL 148 Cardwell Spudder with all necessary equipment and tools. Good lines. Call or write L. C. Smitherman Drilling Company—Box 627—Augusta, Kansas—Phone 1330.

FOR SALE, medium and medium large rotary rigs in excellent condition and priced right for sale. Box J-139, The Oil and Gas Journal, Tulsa, Oklahoma.

USED CASING & UNITS. 2500'—9⅝" OD 40# SS Range 2 T. & C. Casing, 2200'—9" OD 40# SS Range 2 T. & C. Casing, 3200'—7" OD J55 SS 20# Range 2 8 Rt. Thread Casing. 1—TC 44 Lufkin Unit Serial 2257U with H173 Buda Engine. 1—Bethlehem Unit No. 114 DTA 14-20 HP 114000 Torque with F.M. ZC-503 single cyl. Engine. Like New. Oklahoma Pipe & Supply, P. O. Box 4671—Tel. ME 7-4444, Oklahoma City, Okla.

EQUIPMENT WANTED

USED Hydromatic Brake for U-15 Unit Rig Drawworks. Midwestern Drillers, Inc., Wright Building, Tulsa. GIbson 7-5263.

WANTED—S.I.E. GA-7H seismic instruments and cab to rent or rental purchase, by December. State total price, rental agreement, age and condition of instruments. Box J-141, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—6,000 feet 4" O.D. 11 lb./ft. N-80 or J-55 E.U.E. API Tubing. New or good serviceable condition. Wire or write The California Company, 300 North Center Street, Casper, Wyoming.

HELP WANTED

HELP WANTED. Petroleum Engineers Having Two or More Years Experience. Young Independent Oil Company Offering Excellent Opportunity for Advancement and Experience. Give Qualifications, References, and Salary Expected. Box J-149, The Oil and Gas Journal, Tulsa, Oklahoma.

POSITION OPEN FOR WATER-FLOOD PRODUCTION ENGINEER

to provide technical supervision for large developed water-flood project in southeastern Kansas. Performance of duties requires graduate engineer with field experience in flooding operations.
Properties owned by well-established independent producing company; excellent future possibilities for properly qualified individual.
Starting salary $7200 per annum.
All replies confidential. Address
Box J-115, The Oil and Gas Journal, Tulsa, Oklahoma.

Government Surplus Fire Trucks, Like New Condition
Ideal for Refineries, Terminals, Tank Farms, Etc.

One Class 125 Airplane Crash Truck, Fog-Foam, 1942 International 1½ Ton, fully equipped with Bean Royal Triplex Pump, 300 gal. tank, new hoses, nozzles, etc. New tires, new paint finish, 8600 actual miles.
Special Price—F.O.B. Augusta, Kansas, $4,000.00

One Class 500 Fire Truck Pumper, 1942 Chevrolet 1½ Ton, with Hale Centrifugal 500 G.P.M. Pump, Hoses, Ladders and Connections. 3050 actual miles, new paint finish.
Special Price—F.O.B. Augusta, Kansas, $3,000.00

Simon Cohen & Sons Pipe & Supply Company
P. O. BOX 628, PHONE 1288, AUGUSTA, KANSAS
SEND US YOUR INQUIRIES, OTHER MODELS AVAILABLE

HELP WANTED

WANTED: Experienced drilling and production machinery sales engineer; headquarters in New York, traveling worldwide. Salary commensurate with background and experience. In reply, give personal history and experience with photograph. Box J-145, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER—Engineering graduate experienced in the process design of various types of petroleum refining process units required by a midwestern engineering and construction firm. Please submit resume and photograph indicating education, experience, and salary requirements to Box J-136, The Oil and Gas Journal, Tulsa, Oklahoma.

EXCELLENT OPPORTUNITY with independent oil company for GRADUATE PETROLEUM ENGINEER, under 35, at Midland, Texas. Must have three years' West Texas experience and be outstanding in field production problems, workovers, testing, drill stems and completions. Replies confidential. P. O. Box 3003, Dallas, Texas.

QUALIFIED PETROLEUM ENGINEERS, Drilling Engineers, Production and Reservoir Engineers. Positions open in Arabia. Require petroleum engineering degree and suitable experience. One year contract. No family quarters. Excellent benefits, and salary commensurate with experience. Apply in writing, furnishing full description of qualifications and experience to: American Independent Oil Co., 111 Sutter Street, San Francisco, Calif. All replies confidential.

GEOPHYSICIST WANTED

Position open for experienced seismologist, supervisory work—Louisiana coastal area. Headquarters Lafayette, Louisiana. Requirements eight years minimum experience; one to two years experience coastal Louisiana. In reply give personal data, educational qualifications, and details of professional experience.

Box J-130, The Oil and Gas Journal, Tulsa, Oklahoma.

AREA ENGINEERS

Several graduate engineers with minimum 5 years' experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations, manufacturing plants or related operations. To establish technical supervision, procedures, maintenance operations and schedule routine and special work for major oil producing and refining operation with all supporting facilities; i.e., housing, feeding, recreation, etc.

Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 64

ARABIAN AMERICAN OIL COMPANY

505 PARK AVENUE

NEW YORK 22, NEW YORK

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WANTED: Petroleum Reservoir Engineers having two or more years experience. Location of employment, Tulsa, Oklahoma. Give qualifications, references, and salary expected in first reply. Our employees are aware of this ad. All replies will be held confidential. Box J-112, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED DRILLING MAN wanted to manage drilling company on Texas Gulf Coast. Presently has three rigs capable of drilling 8,000, 10,000 and 15,000 feet. Aggressive well-financed contracting firm. Good salary and liberal bonus for the right man, who is capable of getting contracts and expanding the business. Replies confidential. Box J-143, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTIMATOR—Engineering graduate with several years experience in estimating costs of oil refineries and chemical plants for contractor in Chicago area. Submit complete resume and photograph indicating education, experience and salary requirements. Box H-973, The Oil and Gas Journal, Tulsa, Oklahoma.

MAJOR OIL company with Southwestern Gas-Gasoline Plant operations. Has openings for an Engineer with Gas-Gasoline operation experience. Applicant must be a Chemical, Mechanical, or Refining Engineer graduate. Give resume of experience, references, and salary expected in first reply. All of our employees are aware of this ad, and all replies will be held confidential. Box J-113, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS

Upper Midwest Refinery has openings available for Engineers and Engineering Department Head.

1. Engineering Department Head
   Man to head Engineering Department which includes Process and Mechanical Engineering and Laboratory.
2. Instrument Engineer
   Engineer qualified to supervise the work of Instrument and Electrical Division of Mechanical Department.
3. Mechanical Engineer
   Must have at least three to five years of refinery experience.

Please include resume of experience and education and references with reply.

INTERNATIONAL REFINERS, INC.

Personnel Department

BOX #8

WRENSHALL, MINNESOTA

CHEMICAL MARKET RESEARCH

Our expanding consulting service to the chemical process industries means we have openings for young chemists and/or chemical engineers who are looking ahead. No market research training is necessary but some industrial experience is indicated plus an active interest in the economic and marketing phases of the chemical process industries. Obviously training or experience in market research would be valuable.

ROGER WILLIAMS

TECHNICAL & ECONOMIC SERVICES, INC.

148 East 38th Street, New York 16, New York

Murray Hill 5-5257

HELP WANTED

DOMESTIC AND FOREIGN expansion of major contract seismograph company has created openings for Party Chiefs, Seismologists and Senior Computers. Extended experience plus degree in related subject necessary. United Geophysical Corporation, P. O. Box M, Pasadena, California.

EXPERIENCED SEISMOGRAPH Party Chiefs, Seismologists, Chief Computers, Computers, and Surveyors by established and expanding Contract Seismograph Company. Dallas organization. Salary commensurate with experience. State qualifications, references, and salary expected in first reply. Must be free to move with field party. Box J-102, The Oil and Gas Journal, Tulsa, Oklahoma.

GASOLINE PLANT REPAIRMAN

Experienced on angle and horizontal engine-compressors, turbines, reciprocating and centrifugal pumps, oil field engines, some light welding desirable. Particularly familiar with preventive maintenance programs. North central Texas locations. Replies should contain details of experience and references.

Box J-132, The Oil and Gas Journal, Tulsa, Oklahoma.

WAREHOUSEMAN

PETROLEUM REFINERY

SANTOS, BRAZIL

Extensive experience in cataloging spare parts & setting up a system of warehousing and inventory for all types of pumps, valves, compressors, blowers & piping & all other materials & equipment & spare parts for same, common to a petroleum refinery.

Challenging opportunity. Excellent base salary plus living allowance. Family transported to Brazil at our expense.

Interview arranged at our expense on basis of confidential complete chronological resume, including education & employment (names & addresses of employers, dates employed, positions held & your specific duties & scope of responsibility, salaries received, location & type of jobs, etc.). Airmail data to

PERSONNEL DEPARTMENT

HYDROCARBON RESEARCH, INC.

115 Broadway **New York 6, N. Y.**

SITUATIONS WANTED

GEOLOGIST, Ph.D., 18 years widely varied experience of foreign operations, exploration and development, seeks responsible executive position. Box J-126, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: B.S.; 25; experienced at subsurface mapping, well-sitting, and evaluation reports; also experienced at leasing and negotiating farmouts and drilling contracts. Box J-140, The Oil and Gas Journal, Tulsa, Oklahoma.

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Equipment Men

Stewart & Stevenson Made Distributors for Greer

Stewart & Stevenson Distributing Co., Houston, has been named national distributor, exclusive of California, for Greer mud-pump pulse dampers and drill-rig blowout preventers, it was announced by G. Lawton Johnson, vice president, Greer Hydraulics, Inc. California will be serviced by the Greer West Coast office.

Stewart & Stevenson Distributing Co. has offices located at all oil-producing fields in continental United States. The company will provide both sales and service and will stock parts for Greer's line of drill-rig hydraulic accessories, including a patented line of blowout preventers and mud-pump pulse dampers. Robert M. Hardy is general manager.

Marsh Instrument Names New District Salesman

Thomas E. Zurick has been appointed sales representative for Marsh Instrument Co. in Kentucky and West Virginia. Zurick was with Fairbanks-Morse before joining the Marsh sales staff.

Oil Base, Inc., Moves Al Seaman to Oklahoma

The appointment of Al Seaman to the post of territorial manager for the Oklahoma-Kansas area with offices in Oklahoma City, has been announced by Thad Randolph, executive vice president in charge of sales for Oil Base, Inc. A sales engineer in the San Joaquin Valley, Seaman has been with the company for 6 years, operating out of Bakersfield. He serviced the Black Magic oil-base-mud system used in Ohio Oil's world-record well at Paloma.

Service Pipe Line Awards Systems Contract to Union

Contracts for four more centralized transport-control systems to govern operations at four Wyoming pump stations have been awarded Union Switch & Signal, division of Westinghouse Air Brake Co., by Service Pipe Line Co. These systems will permit remote control of the flow of crude oil through some 180 miles of pipeline.

The first installation was made at Shoshoni and controlled from Lost Cabin. The new orders call for installations at Big Muddy, Owl Creek, Horseshoe, and Wendover pump stations. These will be controlled from Casper, Kirby, and Welsh stations respectively. The latter station is controlling point for both Horseshoe and Wendover, although the control systems will operate independently.

These all-relay systems will enable operators at controlling stations to actuate pump motors and valves at pump stations by simply pressing push buttons. Faults such as hot pump or motor bearings will automatically begin shutdown of operations at the affected station. Proper sequencing of the operations is automatically insured by system circuitry. Indication lights on a control panel keep operators informed of these and other occurences at the remote locations.

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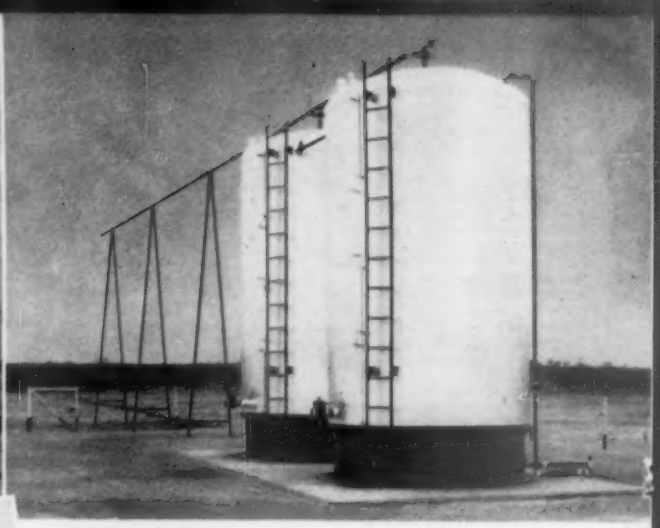

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